EXCELLENCE
Axidyne®
IN MOTION®
ALL NEW CONTROL SYSTEMS
•Brushless Servo
•Stepper
•Brushed DC
MECHANICAL ACTUATORS
•Screw-drives
•Belt-drives
New B3B Series!
TOL-O-MATIC
TOL - O - MATIC
MSD
MS5
SSD
ELECTRIC LINEAR MOTION PRODUCTS FROM TOL-O-MATIC
3600-4077

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A COMPLETE FAMILY OF MOTION CONTROL PRODUCTS

AXIDYNE MECHANICAL ACTUATORS

The Tol-O-Matic Axidyne line of mechanical actuators offers a choice of three load carrier support and guidance systems. Any one of the wide variety of models available can be combined with any of the Axidyne Motion Control Systems to create flexible, dependable and easy-to-use motion control solutions for your application requirements.

SYSTEM SOLUTIONS

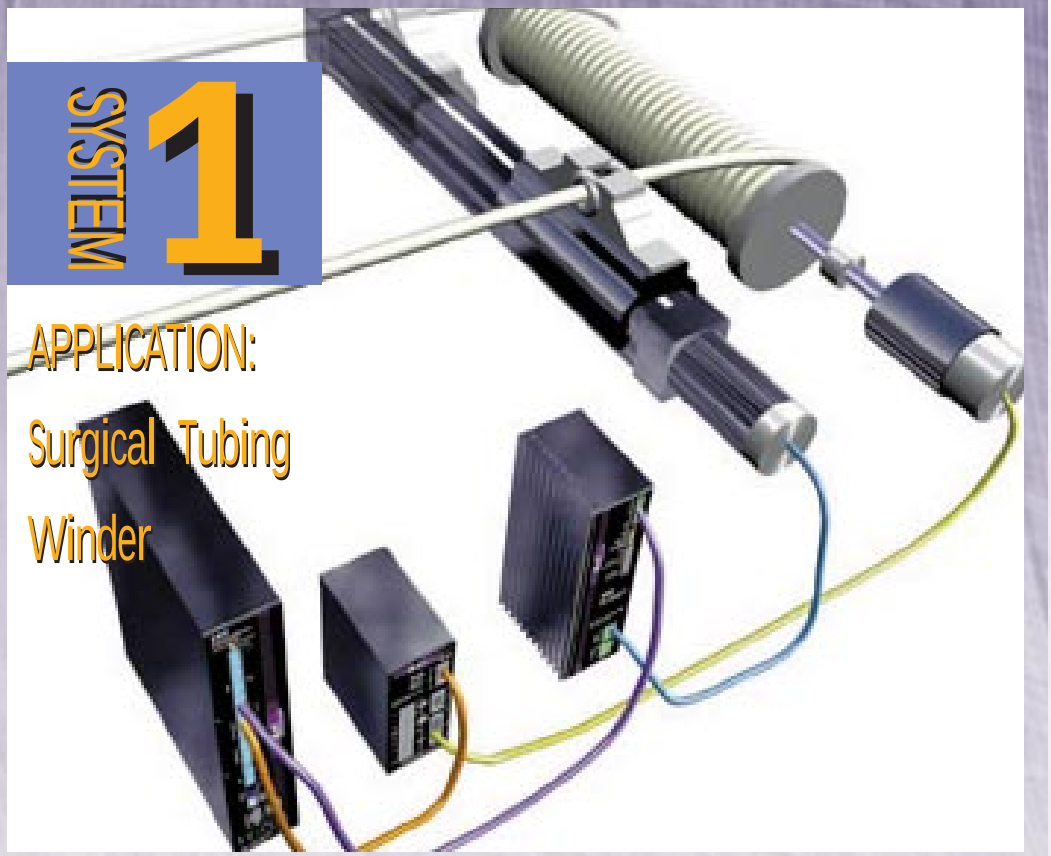
Five different actuator body types combine with eleven different motion control configurations for the widest variety of application solutions from one source—TOL-O-MATIC

MOTION CONTROL SYSTEMS

Axidyne offers all three types of motion control systems—brushless servo, stepper and brushed dc—available in single or multi-axis configurations with performance and cost ranges to fill a wide range of application requirements.

TYPICAL APPLICATION SOLUTIONS

From lower cost, mature brushed dc technologies to higher performance brushless servo systems, Axidyne controls and actuator combinations will get your design up and running.



SYSTEM 1

APPLICATION: Surgical Tubing Winder

APPLICATION DESCRIPTION:

A manufacturer of surgical tubing winds the tubing on a spool with a constant tension as it is drawn. Constant tension is critical so as to not stretch and decrease the opening or wall thickness.

APPLICATION REQUIREMENTS:

- Constant tension to tubing provided by winding spool
- Reciprocating tube position guide
- Tube guide and tensioning must compensate for process speed variations

TOL-O-MATIC SOLUTION:

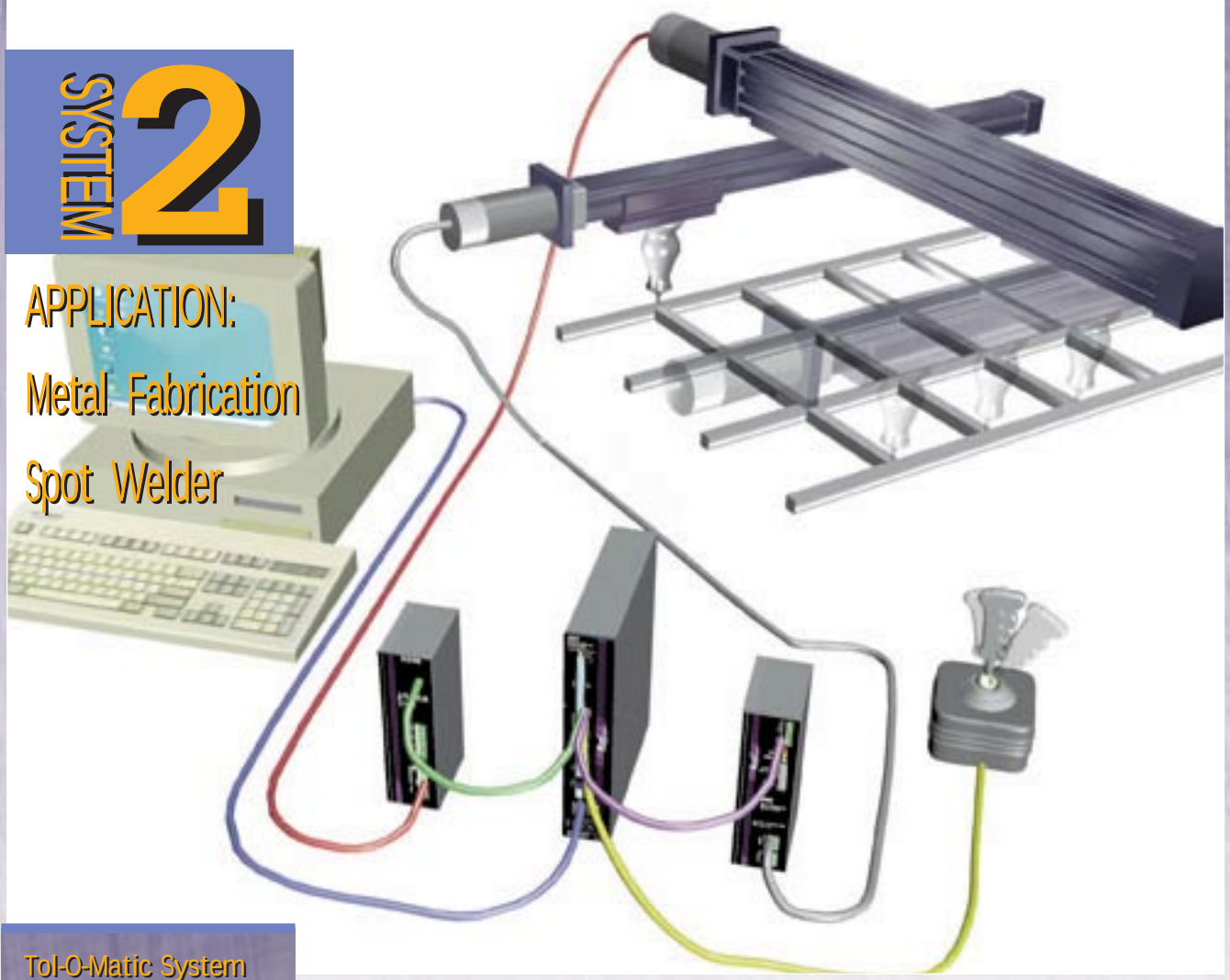
For precise tension control the SSD drive operating in torque mode, with a MRV brushless servo motor provides an optimal solution. The controller must be able to provide torque adjustment that is inversely proportional to the spool diameter. This adjustment will be made each time the tube position guide changes direction. The controller must also be able to provide linear interpolation between the spool motor position and the reciprocating tube guide position. A low cost solution for the reciprocating guide is a BCS Series screw-drive actuator driven by the MSD microstepping drive and a MRS series stepper motor. Therefore, the controller must be able to provide an analog torque signal for the servo drive as well as a step and direction signal for the microstepping drive. Also, the controller must be able to supply a correction algorithm for tension control with linear interpolation between the two axis. The controller for this application is the SSC2 two axis/multi-function controller.

Tol-O-Matic System Components:

- SSC2 two axis controller
- SSD digital brushless servo drive/MRV brushless servo motor
- MSD microstepping drive/MRS stepper motor
- BCS screw drive rod bearing actuator
- Motor couplings, motor adapters and cabling automatically selected using the Tol-O-Motion™ sizing software configuration generator

SYSTEM 2

APPLICATION:
Metal Fabrication Spot Welder



Tol-O-Matic System Components:

- SSC2 two-axis controller
- Two MSD microstepping drives
- MRS342 stepper motor
- MRS343 stepper motor
- JS two-axis joystick
- B3S20 screw-drive recirculating ball bearing actuator
- BCS15 screw-drive rod bearing actuator
- Motor couplings, motor adapters, and cabling automatically selected using the Tol-O-Motion sizing software configuration generator

APPLICATION DESCRIPTION:

A sheet metal fabricator needed to perform multiple spot welds on lot sizes ranging from 50 to 100 pieces. No two lots had welds in the same locations; therefore, setup simplicity was crucial..

APPLICATION REQUIREMENTS:

- Two axis positioning system
- Teach mode
- Repeatability better than ± 0.005
- Speed = 25 inches per second
- Weld head load = 10 lbs

TOL-O-MATIC SOLUTION:

The SSC2 two axis controller with the Tol-O-Motion™ SSC user interface software provides a dedicated joystick teach mode unlike any other for simplicity of multiple axis point-to-point programming. The flexible SSC controller is capable of providing control for any of the Tol-O-Matic drivers (brushed dc servo, brushless servo, or steppers) but since speed and torque requirements allowed the use of a low cost stepper system, the MSD microstepping drives with the MRS stepper motors provided the most cost effective solution. A B3S20 (2" cylinder-style body B3S Series screw-drive) was selected for the primary axis actuator due to the large moment load generated by the secondary axis actuator, motor and load. For the secondary axis a BCS15 (1 1/2" cylinder-style body BCS Series screw-drive) actuator was selected.

SYSTEM 3

APPLICATION:

Furniture Gluing

Tol-O-Matic System Components:

- SSC2 two-axis controller
- Two MSD microstepping drives
- MRS342 stepper motor
- MRS233 stepper motor
- B3S15 screw-drive recirculating ball bearing rodless actuator
- BCS10 screw-drive rodless actuator
- BC210 pneumatic rodless actuator
- Motor couplings, motor adapters and cabling automatically selected using the Tol-O-Motion sizing and selection software configuration generator

APPLICATION DESCRIPTION:

A manufacturer of patio furniture needs to lay a bead of glue in various patterns as one part of a subassembly process to be performed on a single panel as it passes through the machine.

APPLICATION REQUIREMENTS:

- Two-axis control with circular and linear interpolation for glue head positioning
- Ability to quickly and easily define glue pattern
- Glue head feed
- Constant move velocity/glue bead diameter
- Communication to PLC

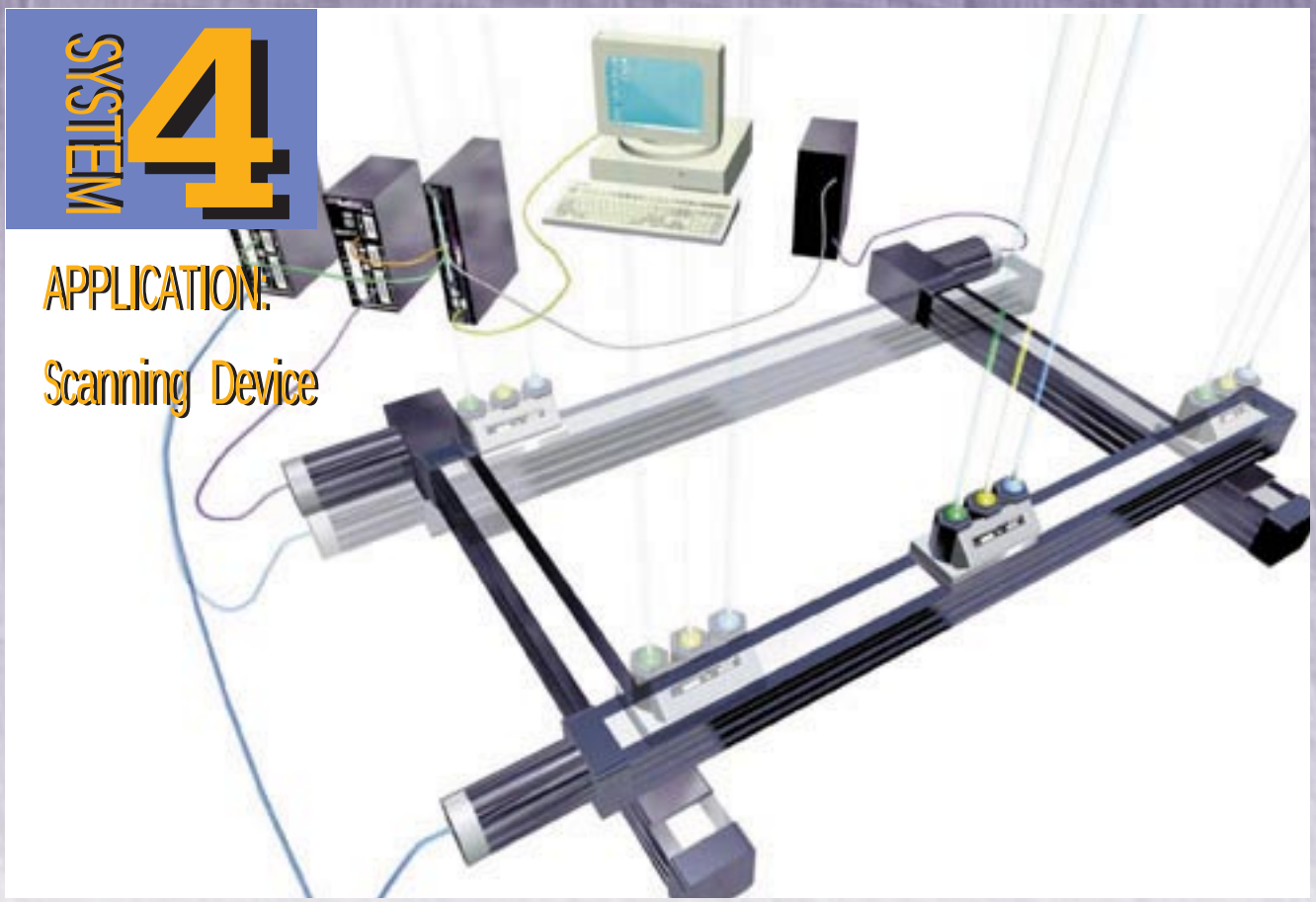
TOL-O-MATIC SOLUTION:

The SSC2 two-axis controller, using the Tol-O-Motion SSC mouse teach mode, allowed the user to define arcs and line segments with the click of a mouse. With only moderate to low speed requirements for positioning the gluing head, this application was solved most cost effectively with the MDS microstepping drives and MRS stepper motors. In this application a positional accuracy better than 0.1 was all that was required. Therefore, the BCS style actuator was first choice. However, the moment load generated by the second axis actuator and gluing head drove the application to a B3S15 actuator as the primary axis. Also, by choosing Tol-O-Matic, this customer was able to save additional cost by integrating a rodless pneumatic cylinder as a constant force glue feed, in place of an additional drive, motor, and electric actuator.

SYSTEM 4

APPLICATION:

Scanning Device



Tol-O-Matic System Components:

- SSC3 three-axis multi-function controller
- Two SSD20 digital servo drives
- Two MRV341 brushless servo motors
- SSD10 digital servo drive
- Two B3B15 belt-drive actuators
- B3S10 screw-drive actuator
- Motor couplings, motor adapters and cabling automatically selected using the Tol-O-Motion sizing and selection software configuration generator

APPLICATION DESCRIPTION:

The developer of a new scanning device requires a method of traversing the device 48 inches in the X axis in less than 1 second and then indexing along the Y axis over a distance of 72 inches following each X axis scan.

APPLICATION REQUIREMENTS:

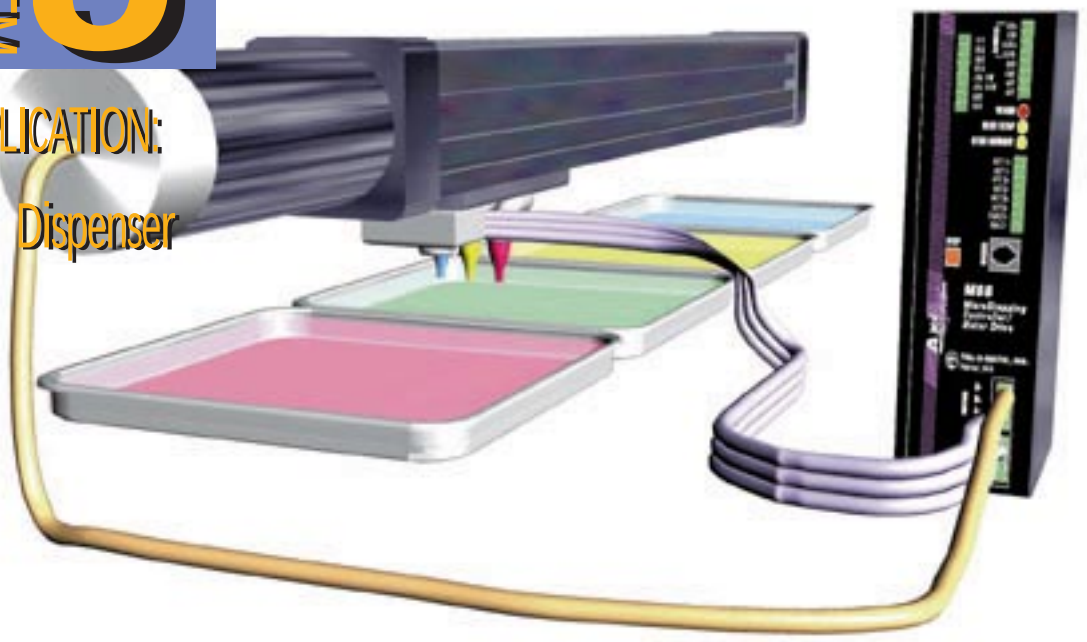
- X-Y positioning of a 50 lb. scanning head
- 48-inch X axis move in less than 1 second
- 72-inch Y travel distance
- Better than 0.010-inch repeatability

TOL-O-MATIC SOLUTION:

Speed and stroke requirements in the X axis do not allow the use of a screw actuator. The moment load generated by the scanning head and 72-inch Y axis does not allow a single actuator to be used for the X-axis. Therefore, two B3B150 belt-drive actuators were used in the gantry configuration shown. The speed requirement also do not allow the use of stepper or brushed dc systems. MRV brushless servos, driven by the SSD drives were used in this system and controlled by a 3-axis SSC3 controller. The two X axis motors/drives were electronically geared together while operating the third axis independently. Programming was done over RS232 from a PC using the user friendly Tol-O-Motion™ SSC programming software.

SYSTEM 5

APPLICATION:
Dye Dispenser



Tol-O-Matic System Components:

- MSS microstepping drive/controller
- MRS341 stepper motor
- B3S150 screw-drive rodless actuator
- Motor couplings, motor adapters and cabling automatically selected using the Tol-O-Motion sizing and selection configuration generation.

APPLICATION DESCRIPTION:

A clothing manufacturer needed to maintain constant levels of dye in a tray dispenser that they used to continuously supply dye. They had a method of detecting the levels of die in a tray and were looking for a method to traverse back and forth across the tray to both detect levels and dispense dye.

APPLICATION REQUIREMENTS:

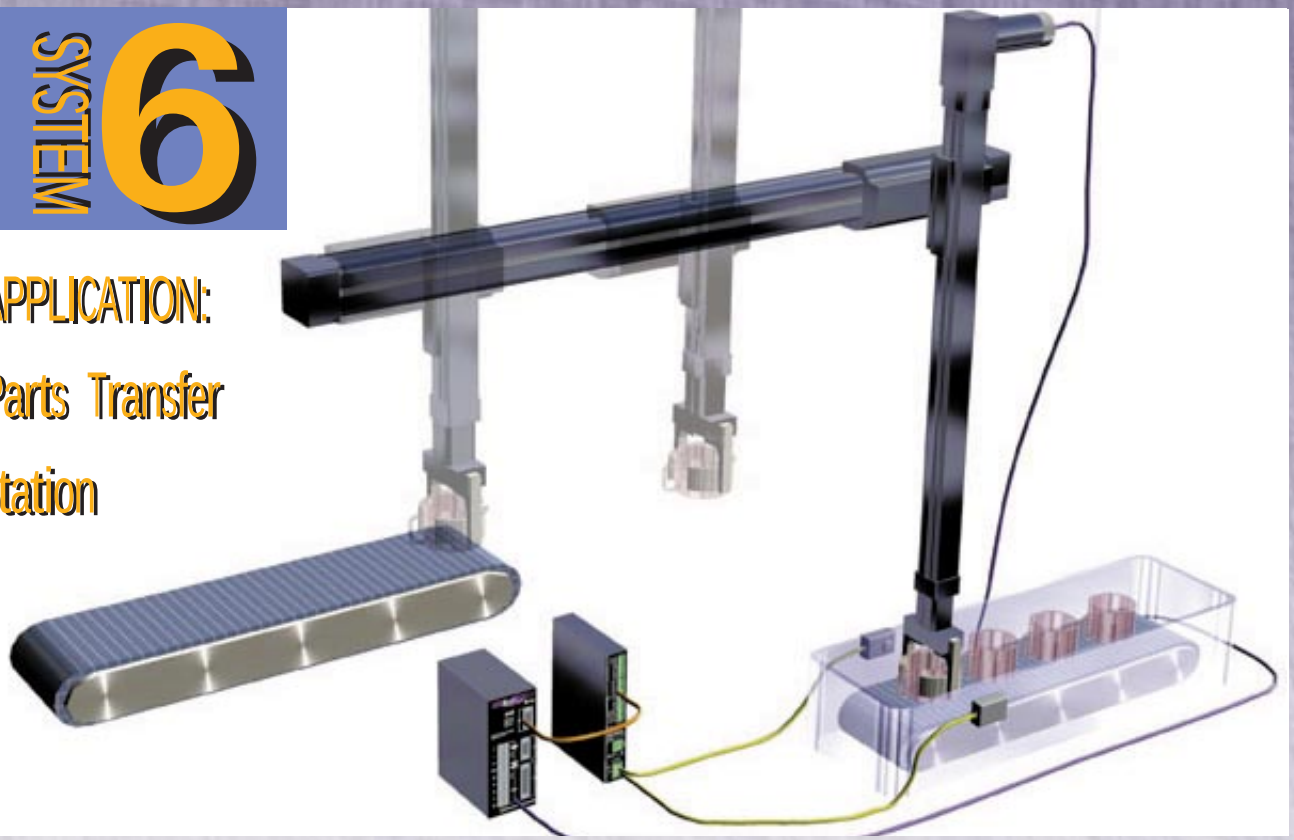
- Single axis system
- Very slow speed (less than 1-inch per second
- Watch for level low detector and evaluate which of three dye dispensers to turn on based on location.

TOL-O-MATIC SOLUTION:

This application was solved with the simplest system to set up and use, along with the lowest cost controller/drive product offered by Tol-O-Matic. The MSS microstepping system combines the basic single axis controller with a microstepping drive in one package. This controller is capable of being easily programmed to accept the level sensing input and turn on one of three outputs based on its position. The drive is capable of driving any of Tol-O-Matic's MRS stepper motors.

SYSTEM 6

APPLICATION: Parts Transfer Station



APPLICATION DESCRIPTION:

A machine shop wanted to automate the removal of parts from a conveyor passing through a cleaning solution to an assembly line conveyor. Speed was the primary consideration in this application with cost being a close second.

APPLICATION REQUIREMENTS:

- Two-axis linear motion
- Method of grasping parts
- High speed
- Low cost
- Input to controller from sensor to communicate part availability

TOL-O-MATIC SOLUTION:

High speed, low cost and long end-of-stroke positioning describes pneumatics. Partnering with Tol-O-Matic assures the best system solution of both electric and pneumatic components. Therefore, the BC220 (2" bore BC2 Series Band Cylinder) pneumatic actuator was used for the primary axis to limit the dynamic moment load generated at the ends of stroke. Pneumatics was also used to grasp the parts by using a GPP100 parallel gripper. Since the secondary axis required stops in three different positions and a controlled deceleration when placing parts onto the conveyor, pneumatics was not a good choice for the secondary axis. In order to achieve the highest possible speed a belt-drive was selected instead of a screw-drive so the actuator critical screw speed was not an issue. The MRV brushless servo motor and SSD brushless servo drive were selected for their high speed capability of up to 6000 RPM. For basic single axis servo control with I/O available to receive a part availability signal from the proximity sensor and send commands to activate valves for the primary axis and gripper, the MSC was a low-cost, simple to use choice.

Tol-O-Matic System Components:

- MRV232 brushless servo motor
- SSD10 digital servo drive
- MSC basic controller
- BCB15 belt-drive actuator
- BC220 pneumatic rod-less cylinder
- GPP100 parallel gripper
- Motor couplings, motor adapters and cabling automatically selected using the Tol-O-Motion sizing and selection configuration generator

SYSTEM 7

APPLICATION:
Parts Feed

Tol-O-Matic System Components:

- MSCLDC single-axis basic controller/brush motor driver
- MRB342 brush motor with 500 line encoder
- PIT panel mount user interface
- B3B20 belt-drive actuator
- Motor couplings, motor adapters and cabling automatically selected using the Tol-O-Motion sizing and selection configuration generator.

APPLICATION DESCRIPTION:

An industrial racking manufacturer requires a method of boring numerous inline holes into stands up to 10 feet in length. Hole locations and spacings change from lot to lot, therefore, it is necessary to provide for quick and easy changes of hole positions.

APPLICATION REQUIREMENTS:

- Single-axis system
- Controller output to initiate plunge and drilling operation, input on completion
- 10-foot stroke
- Easy-to-use operator panel interface

TOL-O-MATIC SOLUTION:

This customer was very concerned about minimizing noise, therefore more interested in dc rather than stepper systems. Torque and speed requirements could be satisfied with either brush or brushless systems. Since their shop was currently using a number of brush motors and they were accustomed to brush replacement, the MRB brush motors with the MSCLDC controller/brushed servo motor driver was the perfect low cost solution. The PIT panel mount interface was set up to prompt the user for the first hole index, hole spacing and number of holes, providing an operable system for even the most unexperienced users. In order to provide the long strokes and support the moment load generated when drilling at locations up to 5 feet from the carrier, the B3B20 was selected.

Axidyne®
CONTROLLERS, DRIVES AND MOTORS
MSCLDC
MSD

BRUSH LESS

STEPPER

BRUSHED DC

AXIDYNE MOTION CONTROL SYSTEMS OVERVIEW

AN AXIDYNE ELECTRONIC LINEAR MOTION CONTROL SYSTEM IS COMPRISED OF SEVERAL ELEMENTS:

- A mechanical actuator to convert motor rotary motion to linear motion.
- A motor to initiate motion.
- A drive to respond to signals from the controller and deliver power to move the motor.
- A controller to store and/or interpret high level commands received from a computer or operator interface, and to generate the necessary signals to control motor velocity, acceleration, position, and direction based on program and discrete inputs.
- An operator interface to allow system operators to program or signal the controller remotely.

This modular approach provides flexibility in control system design and helps provide the most cost-effective solution to a range of linear motion control requirements.

MECHANICAL ACTUATORS
(B3S, BCS, SLS, M3S, MSC, MLS, B3B, BCB, M3B, MCB)

MOTORS
MRV (Brushless Servo)
MRS (Stepper)
MRB (Brushed DC)

DRIVES
SSD
MSD
DM5/6, DMCLDC

CONTROLLER/DRIVES
MSS
MSCLDC DM5/6C

CONTROLLERS
MSC, SSC

OPERATOR INTERFACES
PIT, JS, SIT

General Requirements:

- The motor must provide the torque and speed necessary for the actuator to meet the application requirements.
- The drive must convert the local power source to the power input required by the motor.
- The motor and the drive power ratings (watts) must match the peak and the RMS requirements of the application.
- The controller allows inputs from the operator or supervisory system (PLC or computer) to properly control the motor and achieve the required motion profile(s).

Axidyne Motion Control Systems

Axidyne systems include brushless servos, brushed dc servos, microsteppers, and open loop dc.

• Brushless Servo System

▲ Extremely smooth and quiet operation
▲ Good for high torques [up to 45 in-lbs. (5.08 N-m) continuous, 140 in-lbs. (15.82 N-m) peak]
▲ Good for high speeds, up to 6,000 RPM
▲ High resolution, 4,000 counts per revolution
▲ Provide torque control
▲ Good for short, repetitive moves
▲ Maintenance free

• Brushed DC System

▲ Low to medium cost
▲ Smooth and quiet operation
▲ Good for speeds generally less than 2500 RPM
▲ Good for torques up to 32 in-lbs. (3.62 N-m) continuous, 48 in-lbs. (5.42 N-m) peak
▲ Good for resolutions of 1,000 counts per revolution
▲ Servo or open loop

• Microstepping System

▲ Lowest cost for precise positioning
▲ Highest resolution [up to 50,800 steps- rev] without feedback device
▲ Good for speeds less than 2,000 RPM
▲ Good for torque requirements less than 35 in-lbs. (3.95 N-m)
▲ Smoothness better than full or half step, but not as good as servos
▲ Good for short, repetitive moves
▲ Maintenance free

Easy TOL-O-MOTION

SIZING AND SELECTION SOFTWARE

Tol-O-Matic is your one source solution! Complete electric motion solutions from Tol-O-Matic eliminate the time and hassle of mixing, matching and integrating components. Use the Free Tol-O-Motion Sizing & Selection Software to select the exact system you need.

BRUSH LESS
STEPPER
BRUSHED DC

Easier

Or call your Tol-O-Matic distributor or the factory. Use our expertise to help you select the best system for your application.

Easiest TOL-O-MOTION

MOTION CONTROL SOFTWARE

Set up is easy too. Controllers use the absolute easiest-to-program Tol-O-Motion Motion Control Software. Plain English commands mean no more difficult-to-remember commands and the shortest possible startup time.

BRUSH LESS

MOTORS

MRV231
MRV232
MRV233
MRV234

MRV341
MRV342
MRV343

SERVO DRIVE ONLY

SSD

BASIC SINGLE AXIS

MSC + SSD

Brushless Servo Motors (MRV)

- Rugged industrial enclosures
- Large shafts and bearings for longer life with high radial axial loads
- Convenient MS connectors to simplify motor termination and provide excellent noise immunity
- Common industrial mechanical flanges (NEMA 23, 34)
- Integral Hall-effect devices for commutation
- Integral temperature sensor
- Integral 1000 line TTL encoder with differential line driver outputs
- Ideally suited for use with SSD drives (motor parameters are stored within drive)

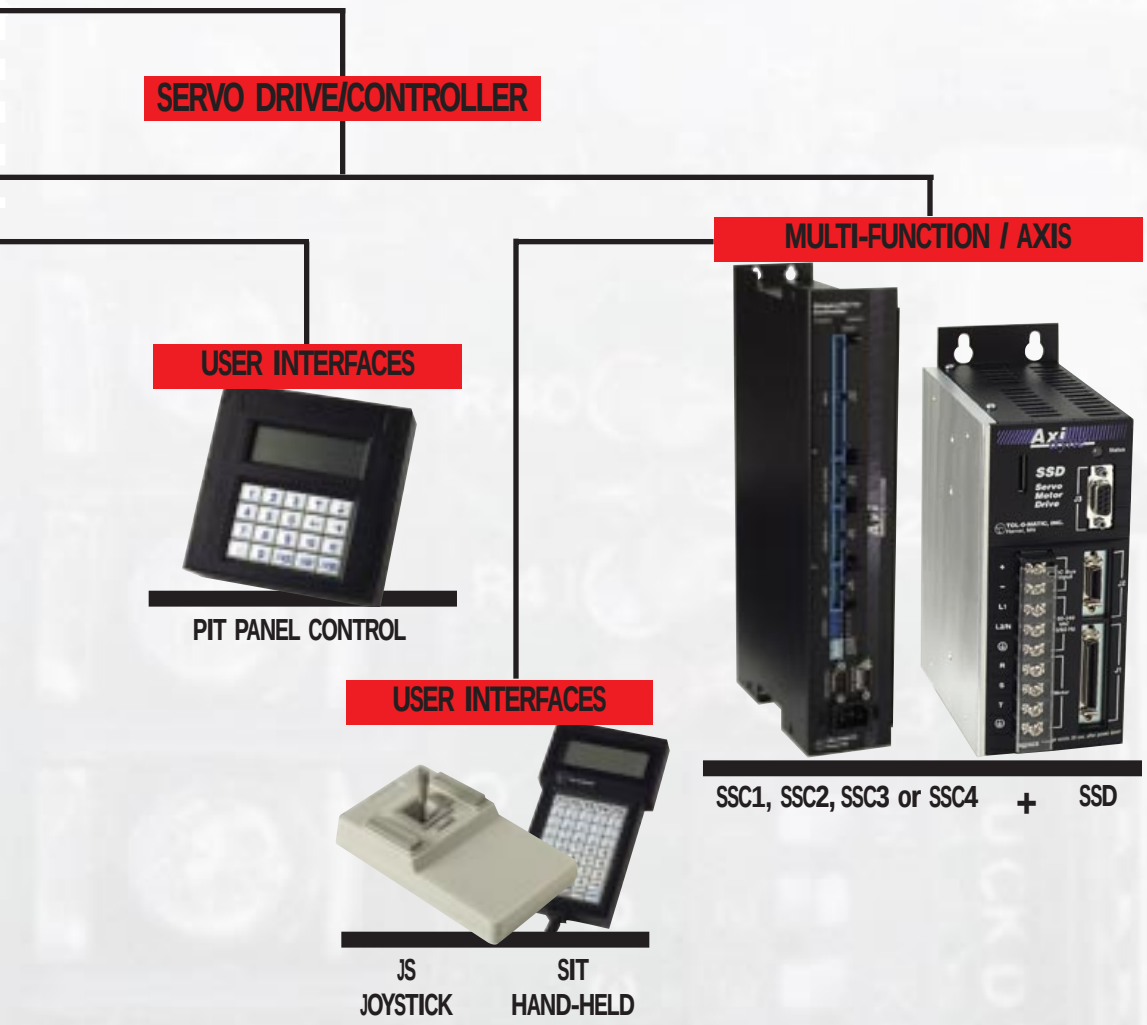
Brushless Servo Drive (SSD)

- Drive MRV series brushless servo motors
- Continuous output ratings of 0.5 kW (SSD5), 1.0 kW(SSD10), 2.0 kW (SSD20)
- Superior performance and functionality to drives over twice the size
- Auxiliary master encoder input with electronic gearing
- 8 preset positions/ speeds/ torques selected via 3 digital input lines
- Digital autotuning for quick and easy setup
- 4 dedicated I/O plus 5 user-selectable optically isolated digital inputs and outputs (sourcing/active high)

Controllers for Brushless Servos (MSC) Basic Single Axis (SSC) Multifunction, 1-4 Axis

MSC Controller:

- Tol-O-Motion MS Motion Control Software allows setup & programming with intuitive icons
- Built-in power supplies: 24 VDC, 100mA is provided for the user for sensors and I/O circuits.
- Differential step and direction outputs
- Accepts 110 or 220 volt AC power
- 4 dedicated, optically isolated inputs: CW and CCW jog, 2 limits
- 4 general purpose, optically isolated inputs
- Drive fault output
- 3 general purpose, optically isolated outputs
- Pluggable screw terminal connectors for I/O, motor, AC power (all mating connectors included)
- Compact package
- Microstep resolution from 200 to 50,800 counts per motor revolution



AXIdyne®

BRUSHLESS SERVO SYSTEMS

Offering the highest performance in motion control systems.

SSC Controller:

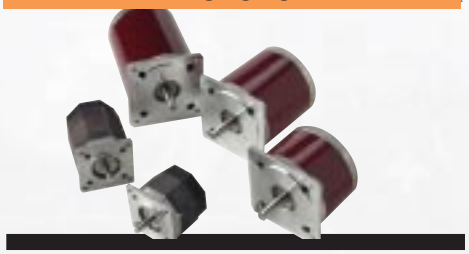
- Tol-O-Motion SSC Motion Control Software allows setup & programming with intuitive icons
- Joystick and Mouse teach modes
- Industrial enclosure
- Uses a 32-bit specialized microcomputer and custom, submicron gate array for highest performance and speed
- Up to 4 axes per unit - up to 4 units can be daisy-chained
- 8,000,000 counts/sec encoder feedback allows high-speed operation–2 encoders per axis
- 4M non-volatile EEPROM memory for executing custom application programs–permits stand-alone operation
- Multitasking feature permits simultaneous execution of four independent applications programs
- Performs any motion task including jogging, point-to-point positioning, linear and circular interpolation, electronic gearing, cam and contouring
- Relative and absolute positioning with more than ±2,000,000,000 counts per move
- Dedicated optoisolated inputs for home, abort, forward and reverse limits – noise immune
- 8 uncommitted, optoisolated inputs and 8 programmable outputs
- 7 analog inputs with 12-bit ADC for interface to joysticks, sensors, pressure transducers, potentiometers (16-bit ADC optional)

Brushless Servo User Interfaces (Host PC, SIT, PIT, JS)

Tol-O-Matic offers three types of user friendly interfaces: PIT panel mount, JS joystick or SIT hand-held controller.

STEPPER

MOTORS



MRS231
MRS232

MRS341
MRS342
MRS343

MICROSTEPPING DRIVE ONLY

MSD

BASIC SINGLE AXIS

MSS

Stepper Motors (MRS)

- Long life bearings
- High temperature insulation
- Exceptional thermal dissipation properties
- NEMA 23 and 34 mounting
- High torque to inertia ratio

Microstepping Drive (MSD)

- Motor current from 0.5 to 5.5 peak amps/phase (switch selectable, 51 settings)
- Step, direction, amplifier enable inputs, fault output, optically isolated
- 16 switch selectable microstepping resolutions: 200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 508000,steps/rev
- Over-temperature protection
- Idle current reduction (50% switch selectable)
- Pluggable screw terminal connectors, mating connectors included

Controllers for Steppers (MSS) Basic Single Axis (SSC) Multifunction, 1-4 Axis

MSS Controller/Drive:

- Combines basic single axis controller and drive
- Tol-O-Motion MS Motion Control Software allows setup & programming with intuitive icons
- Software selectable motor current: 0.5 to 5.5 peak amps/phase
- Drive Voltage: 80 VDC
- Input Voltage: 110 or 220 VAC
- Microstep Resolution: 13 software selectable resolutions, 2000 to 50800 steps/revolution
- Automatic idle current reduction: 0%, 25%, 50% or 100% software selectable
- Two dedicated, optically isolated limit switch inputs, 5 - 24 VDC
- CW and CCW jog inputs
- Four general purpose, filtered inputs
- Drive fault output
- 3 general purpose, optically isolated outputs for interfacing to other equipment

STEPPER DRIVE/CONTROLLER

USER INTERFACES

PIT PANEL CONTROL

MULTI-FUNCTION / AXIS

SSC1, SSC2, SSC3 or SSC4 + MSD

USER INTERFACES

JS JOYSTICK

SIT HAND-HELD

MICRO-STEPPING SYSTEMS

Low cost systems providing high resolution. These systems offer ease of set up and stabilization.

SSC Controller:

- Tol-O-Motion SSC Motion Control Software allows setup & programming with intuitive icons
- Joystick and Mouse teach modes
- Up to 4 axes per unit - up to 4 units can be daisy-chained
- Industrial enclosure
- Uses a 32-bit specialized microcomputer and custom, submicron gate array for highest performance and speed
- 8,000,000 counts/sec encoder feedback allows high-speed operation–2 encoders per axis
- 4M non-volatile EEPROM memory for executing custom applications programs–permits stand-alone operation
- Multitasking feature permits simultaneous execution of four independent applications programs
- Performs any motion task including jogging, point-to-point positioning, linear and circular interpolation, electronic gearing, cam and contouring
- Relative and absolute positioning with more than ±2,000,000,000 counts per move
- Dedicated optoisolated inputs for home, abort, forward and reverse limits – noise immune
- 8 uncommitted, optoisolated inputs and 8 programmable outputs
- 7 analog inputs with 12-bit ADC for interface to joysticks, sensors, pressure transducers, potentiometers (16-bit ADC optional)

Stepper User Interfaces (Host PC, SIT, PIT, JS)

Tol-O-Matic offers three types of user friendly interfaces: PIT panel mount, JS joystick or SIT hand-held controller.

BRUSHED DC

MOTORS

MRB231 MRB231N* MRB341 MRB341N* MRB342 MRB342N* MRB401 MRB401N* MRB402 MRB402N*

* No encoder version for use with open loop configuration.

OPEN LOOP

DC DRIVE

DM5
DM6

DC DRIVE/CONTROLLER

DM5C
DM6C

DC DRIVE

DMCLDC

BASIC SINGLE AXIS

MSCLDC

Brushed DC Motors (MRB)

- Rugged industrial enclosures
- Available with 500 line TTL encoder for servo operation
- Ideal for operation with DM open loop drives or DMCLDC/MSCLDC brushed servo drives

Open Loop Drives and Controllers

DM5/6 Drive:

- Choice of two power ratings (matched to dc motor ratings)
- Self resetting fuse for dc supply to drive
- Lockout fault protection for dc power supply output under-voltage

DM5/6C Drive/Controller:

- Same as DM plus:
- Continuous oscillating cycle, single complete cycle or single direction operating modes
- Predictable first move direction for all modes
- Different profiles can be used for each direction
- Independent dwell at end of move

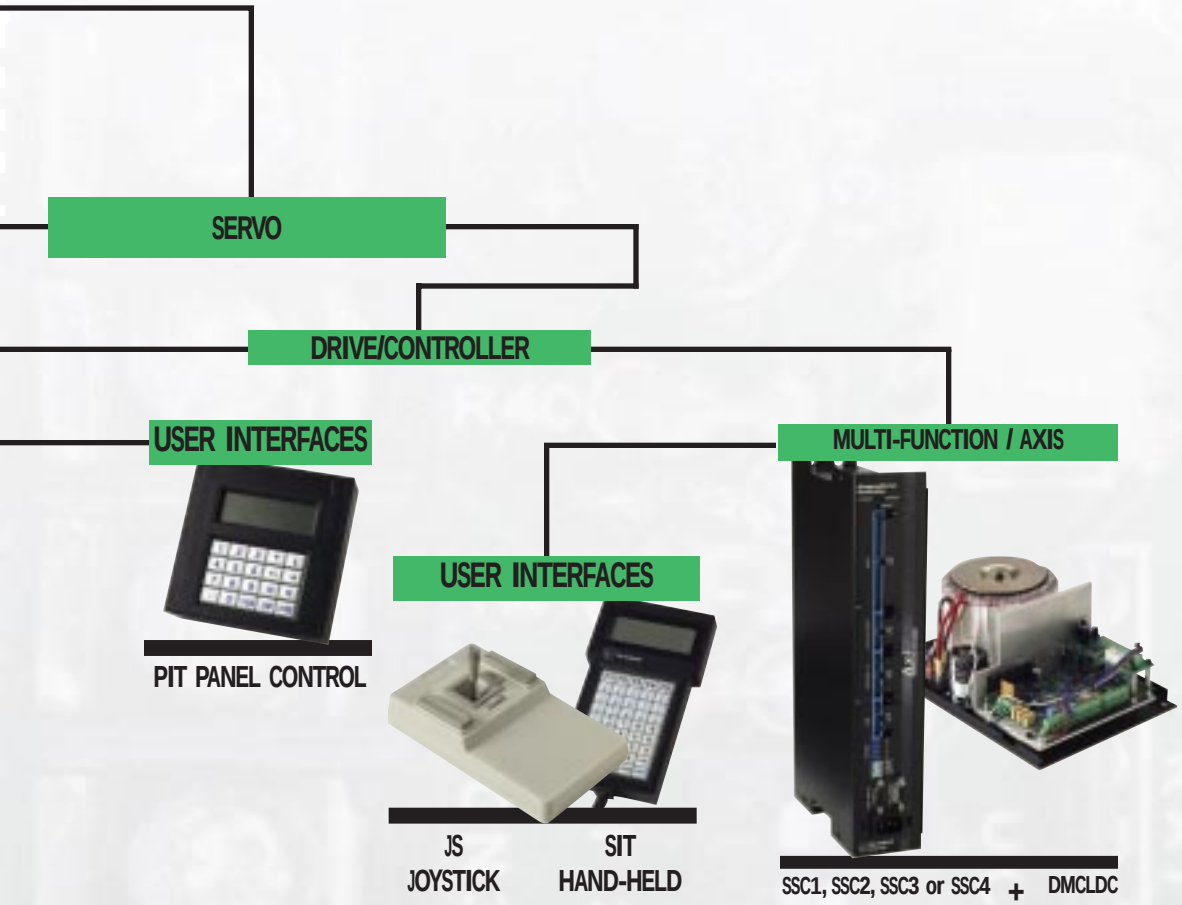
Controllers for Brushed DC Systems (MSCLDC) Basic Single Axis (SSC) Multifunction 1-4 Axis

MSCLDC Controller/Drive:

- Combines basic single axis and drive controller
- Tol-O-Motion MS motion control SW allows setup and programming with intuitive icons
- Position feedback accomplished via a two channel (A&B) differential incremental encoder
- Proportional + Derivative (PD) feedback loop for closing the loop around the motor.
- Enclosed configuration
- Final position error of ± 3 encoder counts. and repeatability of ± 1 encoder count
- Current trip point potentiometer for setting torque fault limit
- Fault condition indication via 2 L.E.D.s to indicate current trip and position error faults for field diagnostics
- Opto-isolated external power
- Potentiometer for Damping and Gain adjustment

Brushed Dc Servo Drive (DMCLDC)

- Line fuse protection
- Position feedback accomplished via a two channel (A&B) differential incremental encoder
- Proportional + derivative (PD) feedback loop for closing the loop around the motor
- Open chassis configuration
- Final position error of ±3 encoder counts
- Repeatability of ±1 encoder count
- Current trip point potentiometer for setting fault limit
- Opto-isolated inputs, 5-30 Vdc (Pulse, Direction, Reset Quad/Full)



Axidyne®

BRUSHED DC SYSTEMS

A low cost technology to meet basic linear motion needs with smooth quiet motion.

SSC Controller:

- Tol-O-Motion SSC Motion Control Software allows setup & programming with intuitive icons
- Joystick and Mouse teach modes
- 8,000,000 counts/sec encoder feedback allows high-speed operation–2 encoders per axis
- Industrial enclosure
- Uses a 32-bit specialized microcomputer and custom, submicron gate array for highest performance and speed
- 4M non-volatile EEPROM memory for executing custom applications programs–permits stand-alone operation
- Up to 4 axes per unit - up to 4 units can be daisy-chained
- Multitasking feature permits simultaneous execution of four independent applications programs
- Performs any motion task including jogging, point-to-point positioning, linear and circular interpolation, electronic gearing, cam and contouring
- Relative and absolute positioning with more than ±2,000,000,000 counts per move
- Dedicated optoisolated inputs for home, abort, forward and reverse limits – noise immune
- 7 analog inputs with 12-bit ADC for interface to joysticks, sensors, pressure transducers, potentiometers (16-bit ADC optional)
- 8 uncommitted, optoisolated inputs and 8 programmable outputs

Brushed DC User Interfaces (Host PC, SIT, PIT, JS)

Tol-O-Matic offers three types of user friendly interfaces: PIT panel mount, JS joystick or SIT hand-held controller.

CONTROLLERS

Axidyne controllers are available for brushless, microstepping and brushed dc systems. Used with Tol-O-Motion motion control software these controllers solve complex motion control problems with ease.

SSC Multi-Axis/ MultiFunction Servo / Stepper Controller

Axidyne's high performance, state-of-the-art motion controller for up to 4 axes of servo or stepper control

MSC Single-Axis Servo / Stepper Controller

This Axidyne motion controller provides the simplest, quickest way to get up and running

SSC 1-4 SERVO/STEPPER CONTROLLER

FEATURES • SPECIFICATIONS • PROGRAMMING • DIMENSIONS • CONNECTORS • ORDERING

The SSC is a high-performance, state-of-the-art motion controller designed for stand-alone operation. Using a 32 bit specialized microprocessor, a custom sub micron gate array, and the Tol-O-Motion SSC visual basic software, the controller provides DSP performance without sacrificing ease of use and cost effectiveness.

The SSC is available with up to 4 axes per unit allowing the user to purchase only the number of axes required. The SSC can also be used to control stepper and /or servo systems.

Designed to solve complex motion problems with superior precision, the SSC can be used for applications requiring jogging, vector positioning of 1-4 axis, 2-D linear or circular interpolation, contouring and electronic gearing.

With the Tol-O-Motion SSC software there is no need to learn another new programming language. Complex motion control is made easy with the plain English programming icons that lead you through the entire programming process from setup to execution. Mouse and joystick teach modes allow the user to setup coordinated motion programs by moving to and clicking on desired locations.

BRUSH LESS

STEPPER

BRUSHED DC

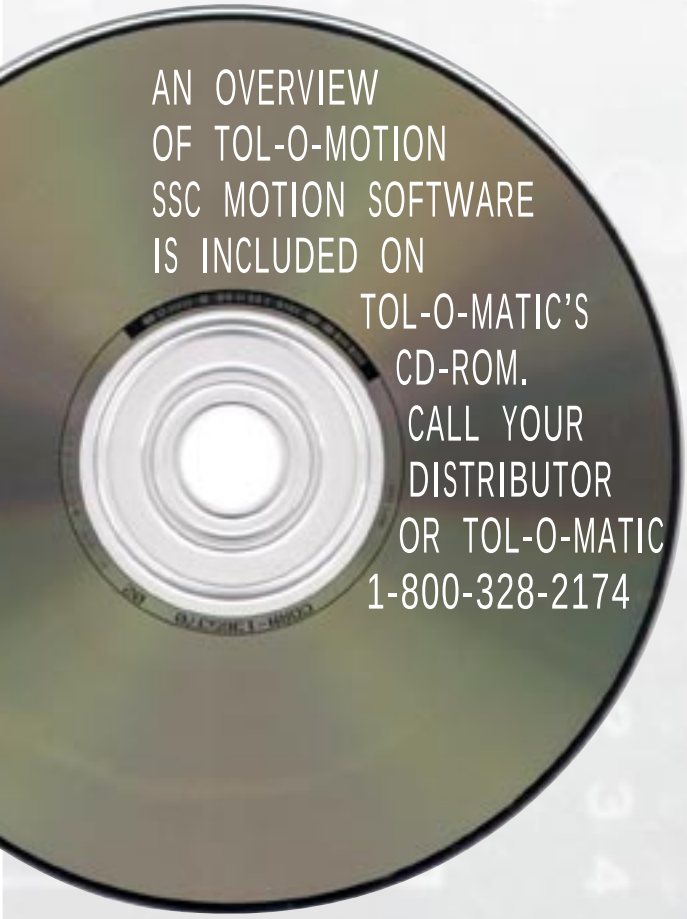
Features:

- ***High performance motion control*** packaged in an industrial enclosure
- ***Uses a 32-bit specialized microcomputer*** and custom, submicron gate array for highest performance and speed
- ***Up to 4 axes per unit*** - up to 4 units can be daisy-chained
- ***125 µsec per axis*** servo update rate for high bandwidth
- ***Controls servo motors and/or step motors***
- ***Sophisticated PID filter*** with velocity and acceleration feed forward for optimum precision
- ***16 bit DAC*** for fine resolution control
- ***8,000,000 counts/sec encoder feedback*** allows high-speed operation–2 encoders per axis
- ***4M EEPROM memory*** for executing custom applications programs–permits stand-alone operation
- ***Multitasking feature*** permits simultaneous execution of four independent applications programs
- ***Programmable acceleration and deceleration*** with profile smoothing to eliminate jerk
- ***Continuous vector feed*** **of infinite** number of linear and arc segments for smooth motion
- ***Contour mode*** for profiling along computer generated paths such as parabolic or spherical profiles
- ***Selectable linear scale*** simplifies linear motion programming
- ***Performs any motion task*** including jogging, point-to-point positioning, linear and circular interpolation, electronic gearing, cam and contouring
- ***Relative and absolute positioning*** with more than ±2,000,000,000 counts per move
- ***Dedicated optoisolated inputs*** for home, abort, forward and reverse limits — noise immune
- ***8 uncommitted, optoisolated inputs and 8 programmable outputs***
- ***7 analog inputs with 12-bit ADC*** for interface to joysticks, sensors, pressure transducers, potentiometers (16-bit ADC optional)
- ***Position feedback*** for each axis can be from analog signal or encoder
- ***Auxiliary encoder inputs and dual-loop damping*** — ideal for backlash compensation
- ***Programmable event triggers*** for monitoring elapsed time, position, speed, and motion complete
- ***I/O functions, timers, and logic functions*** for executing PLC tasks
- ***254 symbolic variables*** and 8000 element array space for data storage
- ***Compact size***: 13" high x 2.5" wide x 6.6" deep
- ***Internal, universal switching power supply*** for direct connection to AC outlet (110V or 220V)
- ***IDC connectors*** on front panel connect to DIN rail mounted screw terminal breakouts included

SPECIFICATIONS

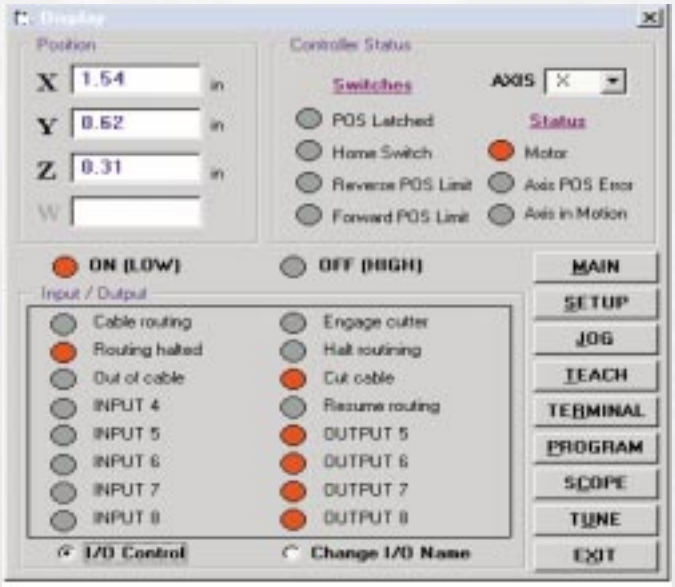
SPECIFICATIONS	SSC Multi-Axis/Multi-Function Servo/Stepper Controller
Performance	
Servo Loop Cycle Time:	SSC 1: 250 µsec; SSC 2: 375 µsec SSC 3: 500 µsec; SSC 4: 500 µsec
Block Execution Time:	In contour mode, up to 1000 blocks (moves)/sec with full trajectory calculation
Position Accuracy:	±1 quadrature count
Velocity Accuracy:	Long-term: phase-locked, better than .003% Short-term: system dependent
Synchronization:	All axes in the same unit are perfectly synchronized and share the same servo cycle. All cards sharing synchronization are perfectly synchronized in the same servo cycle.
Position Capture Accuracy:	25 µsec with optoisolation; 1 µsec if by-pass optoisolation.
Parameter Ranges	
Position Range:	±2,147,483,647 counts/move; automatic rollover; no limit in jog or vector modes.
Velocity Range:	Up to 8,000,000 counts/sec
Acceleration/deceleration:	1,024 to 67,107,840 c/sec^2
Error Limit:	±32,767 counts
Gear Ratio:	±127.9999
Filter Constants:	Kp: 0 to 1023.875 Kd: 0 to 4095.875 Ki: 0 to 2047.875
Motor Command Resolution:	16 bits or .0003 V
Step Motor Control Mode:	Full, half or microstep
Step Pulse Frequency:	2,000,000 pulse/sec
Number of Variables:	254
Array Size:	8000 elements in up to 30 arrays
Memory Size:	1000 lines x 80 characters
Mechanical	
Dimensions:	13" high x 2.5" wide x 6.6" deep
Weight:	6 lbs.
Inputs/Outputs	
Feedback:	Two channels of A/B quadrature per axis with third channel for index. In servo mode, includes auxiliary encoder inputs for each axis. Single ended or differential. Can be configured for quadrature, pulse and direction, or from analog inputs.
General Purpose Inputs:	8 optoisolated inputs
General Purpose Outputs:	8 TTL outputs
General Purpose Analog Inputs:	7, ±10 V; 12-bit resolution (16-bit optional)
Dedicated Inputs per Axis:	Forward and reverse limits, high-speed position latch, home.
Dedicated Outputs per Axis:	Analog motor command, pulse and direction, amplifier enable, encoder output compare.
Available Power to Drive External Devices	
+5 V	1.5 Amp
+12 V	750 mA
-12 V	200 mA

SPECIFICATIONS	SSC Multi-Axis/Multi-Function Servo/Stepper Controller
Environment	
Operating Temperature:	32° to 158° F (0° to 70° C)
Communication Interface	
Selectable Baud Rate:	300, 1200, 4800, 9600, 19200, 38400. Handshake mode available.
I/O Description (Inputs)	
Encoder, A+, B+:	Position feedback from incremental encoder with two channels in quadrature. The encoder can be analog (±12V) or TTL. Note: Encoder that produce outputs in th format of pluses and direction can also be used.
Encoder Index I+:	Once-per-revolution encoder pulse; used in Homing sequence or Find Index command. Minimum index pulse width is 120 nsec.
Encoder, A-, B-, I-:	Optional differential inputs from encoder; used for enhanced noise immunity.
Auxiliary Encoder:	Inputs for additional encoder; used when encoders on both the motor and the load are required.
Abort*#:	Stops commanded motion instantly and also aborts application program.
Reset*#:	System reset.
Forward and Reverse Limit Switch #:	When active, inhibits motion in forward or reverse direction and also causes the limit switch subroutine #LIMSWI to execute.
Home Switch #:	Input for Homing (HM) and Find Edge (FE) instructions.
Input 1 - Input 8#:	Uncommitted inputs; can be defined by the user to trigger events or interrupt program.
Latch#:	High-speed position latch to capture axis position within 25 µsec (bypass optoisolation for .1 µsec capture). AL command arms latch. Input 1, 2, 3, 4 latches X, Y, Z, W respectively.
Analog 1 - Analog 7:	Analog inputs that can be connected to external analog signals such as force or pressure transducers. Can also be used for position feedback. 12-bit resolution ADC for ±10 V input.
I/O Description (Outputs)	
Analog Motor Command:	±10 V range signal for driving servo amplifiers; 16-bit resolution or .0003 V, 3 mA.
Amp enable*:	Signal to disable and enable an amplifier. Amp enable goes low when a motor-off condition occurs. For step motors, this pin provides for reduced current when low.
Step Out:	Pulses for input to a step motor driver. The pulses can be either active low or high. Upon Reset, the output will be low if the SM jumper is on, Tristate if off. The STEP OUT pin also provides the PWM signal for servo motors.
Direction:	Used with the STEP OUT signal to give direction to step motors or servo motors in the sign magnitude mode.
Error*:	The signal goes low when the position error on any axis exceeds the limit specified by the error command, ER.
Output 1 - Output 8:	These 8 TTL outputs are uncommitted and can be designated by the user to toggle relays and trigger external events. The output lines are toggled by Set Bit (SB), Clear Bit (CB), Define Bit (OB), and OP instructions. Upon reset these signals will be low.



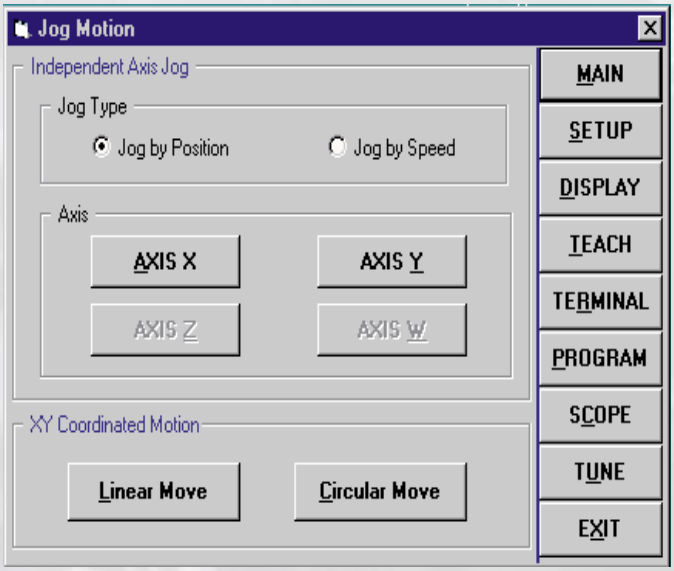
(Tol-O-Motion SS) Motion Software:

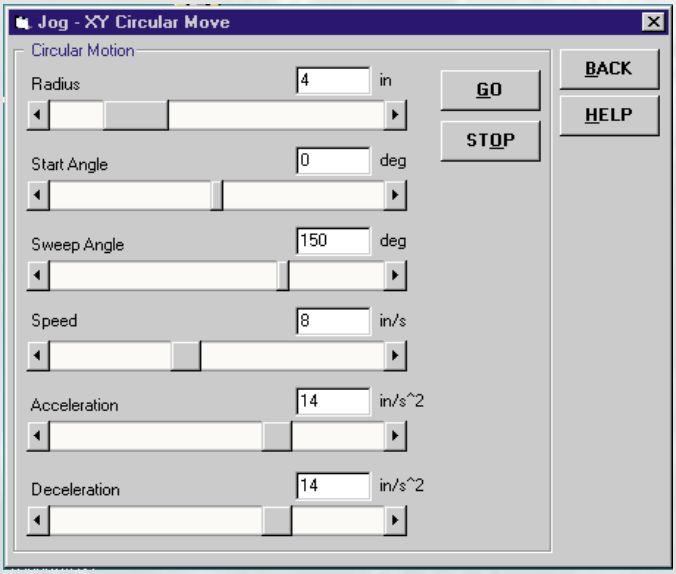
Programming is accomplished through RS232 connection to an IBM compatible PC running Windows 3.1, 95 or NT. Visual Basic panels start out by guiding the user through the complete setup process including communications and axis configuration. The user then is able to enter into different program options including Display panel, Jog, Teach, Programmer, Tune and Data Acquisition.



The Display panel (shown above) allows the user to identify axis locations and status faults, limits, and I/O.

The Jog panels allow the user to easily setup independent motion or coordinated motion. The panels for Jog Setup and Circular Coordinated Motion are shown below.



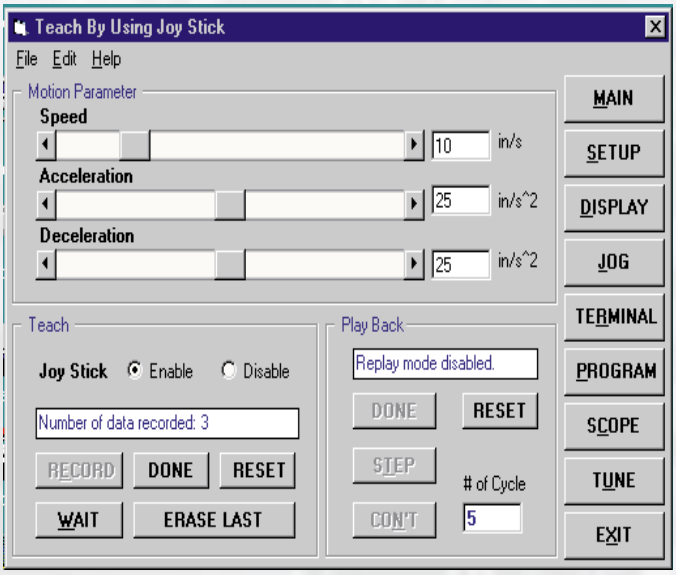


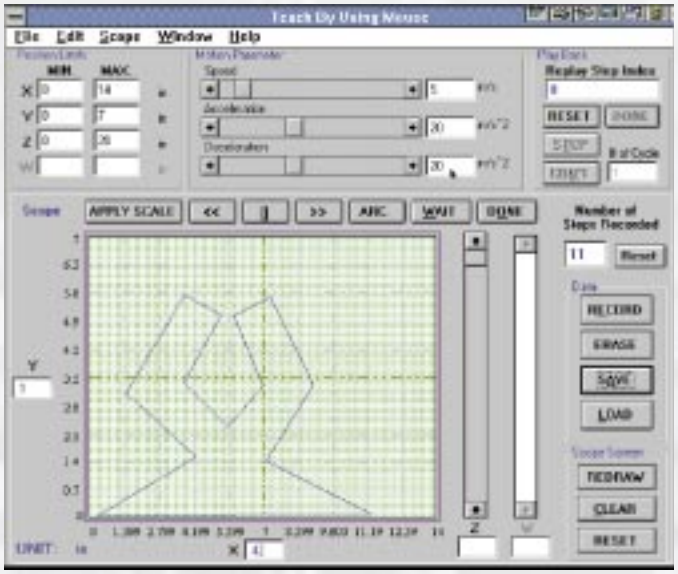
SSC PROGRAMMING (CONT.)

Two Teach modes are available. The easiest way to get up and running is by using the joystick teach mode. This allows the user to write a program by using a joystick to move to the desired positions and pressing a button to record. For more complex coordinated moves, the Mouse Teach mode allows the user to define arcs and vectors on a scaled plot representation of the axis by positioning and clicking the mouse. The Joystick Teach and Mouse Teach modes are shown below.

Program mode allows the user to write programs in plain English commands, without having to pull out command listings and formats. The user clicks on a button for a given function and is guided through the function with various easy to follow panels.

Diagnostics and autotune panels are included to help get the complete system up and running to optimal performance, with ease and confidence.



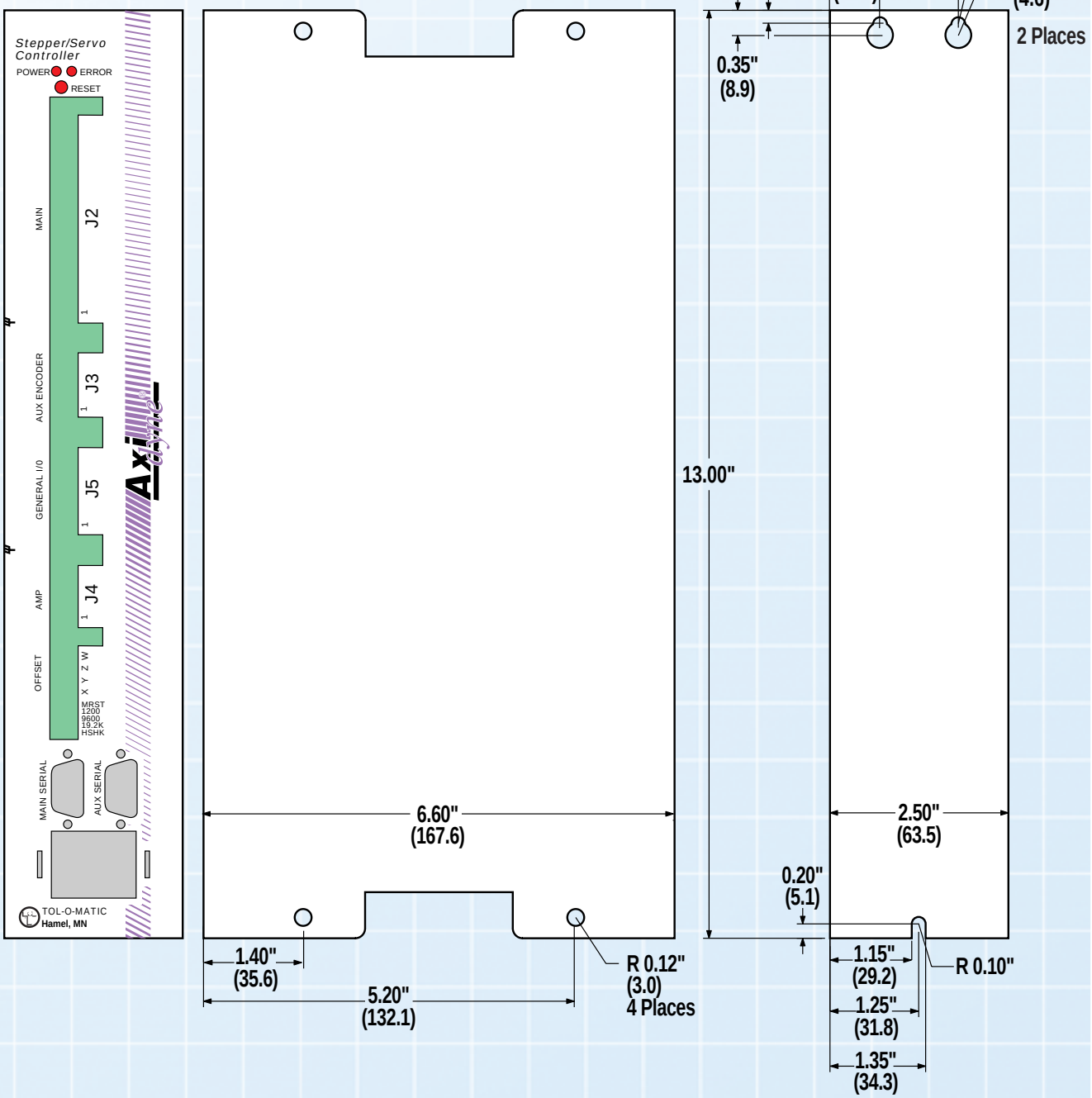


Tol-O-Matic System Compatibility

- Used to control any combination of brushless servo systems (SSD drives/MRV motors), stepper systems (MSD drives/MRS motors), or Brushed servo systems (DMCLDC drives/MRB motors)
- Hand held (SIT) or joystick (JS) user interfaces

DIMENSIONS

SSC 1-4 MULTI-AXIS/MULTI-FUNCTION SERVO/STEPPER CONTROLLER



BRUSH LESS

STEPPER

BRUSHED DC

SSC ORDERING INFORMATION AND CONNECTORS

Connectors

SSC J2 MAIN; 60-PIN IDC;

1	Ground	2	5 V
3	Error	4	Reset
5	Switch Common	6	Forward Limit - X
7	Reverse Limit - X	8	Home - X
9	Forward Limit - Y	10	Reverse Limit - Y
11	Home - Y	12	Forward Limit - Z
13	Reverse Limit - Z	14	Home - Z
15	Forward Limit - W	16	Reverse Limit - W
17	Home - W	18	Output 1
19	Input Common	20	Latch X or Input 1
21	Latch Y or Input 2	22	Latch Z or Input 3
23	Latch W or Input 4	24	Abort Input
25	Motor Command X	26	Amp Enable X
27	Motor Command Y	28	Amp Enable Y
29	Motor Command Z	30	Amp Enable Z
31	Motor Command W	32	Amp Enable W
33	A+ X	34	A- X
35	B+ X	36	B- X
37	I+ X	38	I- X
39	A+ Y	40	A- Y
41	B+ Y	42	B- Y
43	I+ Y	44	I- Y
45	A+ Z	46	A- Z
47	B+ Z	48	B- Z
49	I+ Z	50	I- Z
51	A+ W	52	A- W
53	B+ W	54	B- W
55	I+ W	56	I- W
57	+12 V	58	-12 V
59	5 V	60	Ground

SSC J5 GENERAL I/O; 26-PIN IDC;

1	Analog 1	2	Analog 2
3	Analog 3	4	Analog 4
5	Analog 5	6	Analog 6
7	Analog 7	8	Ground
9	5 V	10	Output 1
11	Output 2	12	Output 3
13	Output 4	14	Output 5
15	Output 6	16	Output 7
17	Output 8	18	Input 8
19	Input 7	20	Input 6
21	Input 5	22	Input 4 (Latch W)
23	Input 3 (Latch W)	24	Input 2 (Latch W)
25	Input 1 (Latch W)	26	Input Common (Isolated 5 V)

SSC J3 AUXILIARY ENCODER; 20-PIN IDC;

1	Sample Clock	2	Reserved
3	B- Aux W	4	B+ Aux W
5	A- Aux W	6	A+ Aux W
7	B- Aux Z	8	B+ Aux Z
9	A- Aux Z	10	A+ Aux Z
11	B- Aux Y	12	B+ Aux Y
13	A- Aux Y	14	A+ Aux Y
15	B- Aux X	16	B+ Aux X
17	A- Aux X	18	A+ Aux X
19	5 V	20	Ground

SSC J4 DRIVER; 20-PIN IDC;

1	Motor Command X	2	Amp Enable X
3	PWM X/Step X	4	Sign X/Dir X
5		6	Motor Command Y
7	Amp Enable Y	8	PWM Y/Step Y
9	Sign Y/Dir Y	10	
11	Motor Command Z	12	Amp Enable Z
13	PWM Z/Step Z	14	Sign Z/Dir Z
15	5 V	16	Motor Command W
17	Amp Enable W	18	PWM W/Step W
19	Sign W/Dir W	20	Ground

AC POWER INPUTS; 4-PIN DETACHABLE SCREW TYPE:

Hot	Connects to 110 or 220 AC
NC	No Connect
Neutral	Return for AC
Earth	Chassis input

RS232 - MAIN PORT; 9-PIN:

1	CTS - output	2	Transmit data - output
3	Receive data - output	4	RTS - input
5	Ground	6	CTS - output
7	RTS - input	8	CTS - output
9	5 V		

RS232 - AUXILIARY PORT; 9-PIN:

1	CTS - input	2	Transmit data - input
3	Receive data - output	4	RTS - output
5	Ground	6	CTS - input
7	RTS - output	8	CTS - input
9	5 V		

Configuration Code	Includes
See below	• 7ft. (2m) RS232 Cable • 60 pin/18" (457mm) ribbon cable & 60 pin breakout* • 26 pin/18" (457mm) ribbon cable & 26 pin breakout* • If any axis configured w/ step & direction output - 20 pin/18" (457mm) ribbon cable & 20 pin breakout** • User Manual • Tol-O-Motion SSC Software

SSC _ _ (MULTI-AXIS/MULTI-FUNCTION SERVO STEPPER CONTROLLER)					
Configuration Code	Axis X**	Axis Y	Axis Z	Axis W	Tol-O-Matic Part #
SSC 10	per Drive	-	-	-	3600-0044
SSC 21	per Drive	ST	-	-	3600-0045
SSC 22	per Drive	SV	-	-	
SSC 31	per Drive	ST	ST	-	3600-0046
SSC 32	per Drive	ST	SV	-	
SSC 33	per Drive	SV	ST	-	
SSC 34	per Drive	SV	SV		
SSC 41	per Drive	ST	ST	ST	3600-0047
SSC 42	per Drive	ST	ST	SV	
SSC 43	per Drive	ST	SV	ST	
SSC 44	per Drive	ST	SV	SV	
SSC 45	per Drive	SV	ST	ST	
SSC 46	per Drive	SV	ST	SV	
SSC 47	per Drive	SV	SV	ST	
SSC 48	per Drive	SV	SV	SV	
ST = STEP AND DIRECTION OUTPUT SV = ± 10 V OUTPUT					

Systems will be preconfigured at factory by using the appropriate 5th digit in configurator. The unit may be changed by the user at a later time by the insertion or removal of jumper.

*** To avoid shipping with DIN rail mount break out terminals, add BON to configurator**

**** X axis is configured according to drive ordered**
•If DMCLDC or MSD configured for step and direction output
•If SSD configured for ±10 V output

CABLES			
Description	Tol-O-Matic Part No.	Description	Tol-O-Matic Part No.
20 pin breakout	3600-1340	26 pin ribbon cable	3600-1346
26 pin breakout	3600-1341	60 pin ribbon cable	3600-1347
60 pin breakout	3600-1342	RS232 Cable	3600-1172
20 pin ribbon cable	3600-1345		

MSC MICROSTEPPING CONTROLLER

FEATURES • SPECIFICATIONS • PROGRAMMING • DIMENSIONS • ORDERING

The MSC Microstepping Controller provides the simplest, quickest way to get up and running in a single axis application. The Tol-O-Motion MSC software allows sophisticated programming to be achieved by even the most novice user, through icons arranged in a simple, easy to follow format. Once programmed over the RS232 the PC may be removed and program interaction achieved through I/O, or by using the PIT panel mount interface. The MSC Microstepping controller comes as a stand alone controller making it ideal for operation with the SSD brushless servo drive, or in a similar configuration integral to the MSD microstepping drive (MSS) or the DMCLDC brushed DC motor driver (MSCLDC).

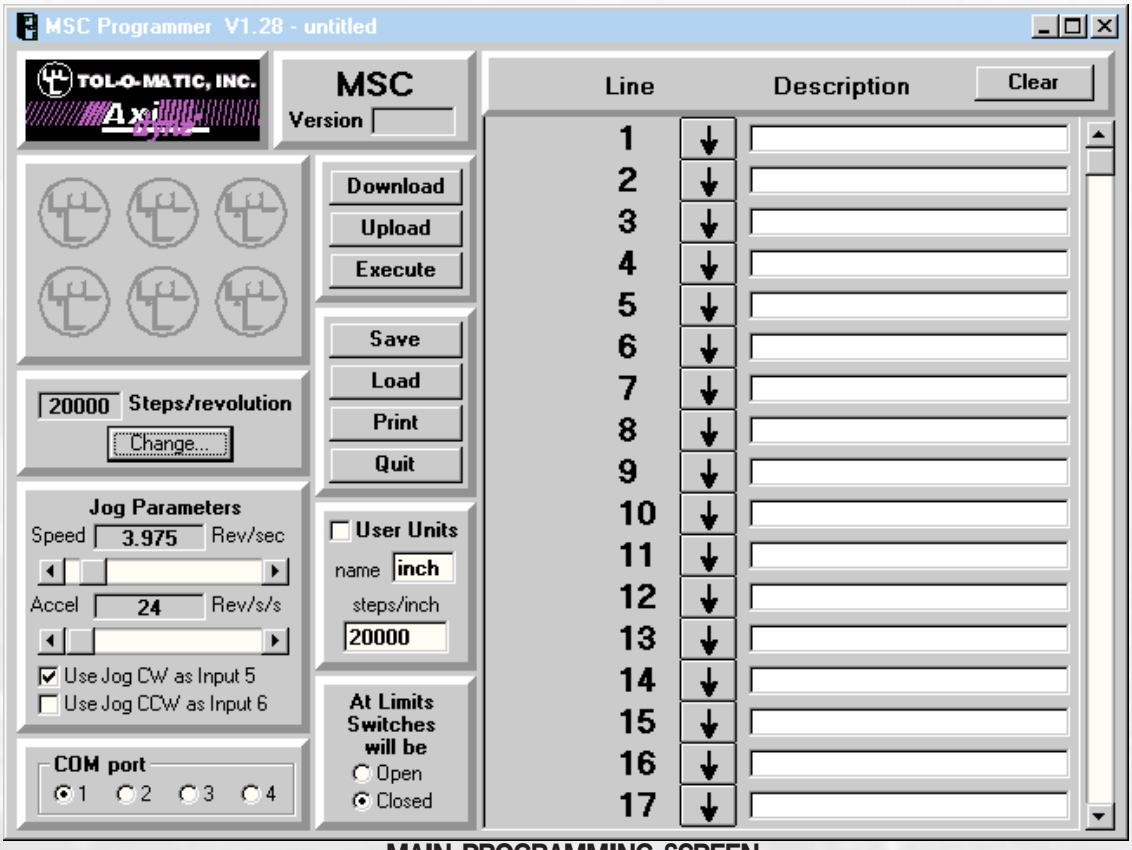
Features:

- ***Built-in power supplies***: 24 VDC, 100mA is provided for sensors and I/O circuits.
- ***Accepts 110 or 220 volt AC power***
- ***4 dedicated, optically isolated inputs:*** CW and CCW jog, 2 limits
- ***4 general purpose, optically isolated inputs***
- ***Drive fault output***
- ***3 general purpose, optically isolated outputs***
- ***Pluggable screw terminal connectors*** for I/O, motor, AC power (all mating connectors included)
- ***Selectable linear scale*** simplifies linear motion programming

SPECIFICATIONS

SPECIFICATIONS	MSC Microstepping Controller
Power	
Input Voltages (AC line):	110 or 220 Vac, 50-60Hz (switch selected)
Input Current (AC line):	0.2A max. at 110 Vac
Input Fuses (AC line, L1 & L2/N):	0.25A fast acting TR5 style
Parameter Ranges	
Distance:	1 to 16,000,000 steps
Speed:	.025 to 50 revolutions per second (in any microstep resolution)
Acceleration:	1 to 3000 rev/sec/sec
Deceleration:	1 to 3000 rev/sec/sec (set independently from acceleration)
Time Delays:	0.1 to 25.5 seconds
Output Pulse Widths:	2 to 500 milliseconds
Iterations per loop:	1 to 255
Microstep Resolution:	200-50800 steps/rev
Outputs	
5V:	50 mA used by PIT (if connected) ±5%, 100 mA max, self resetting fuse,Not isolated from internal circuitry
24V:	±5%, 100 mA max, self resetting fuse, Not isolated from internal circuitry
STEP & Dir (logic high):	2.5V min, 3.4V typ, with 20mA load
STEP & Dir (logic low):	0.5V max, 0.3V typ, with 20mA load
STEP output frequency:	50 Hz to 2.54 MHz
STEP output duty cycle:	50%
I/O	
Inputs:	bidirectional, optically isolated, 5-24 Vdc
Input impedance - IN 1-4, CW Jog, CCW Jog, limits:	2200 Ohms
Outputs:	optically isolated, sourcing or sinking
output current (Out 1-3):	100mA max
output voltage (Out 1-3):	24Vdc max
Environment	
Ambient Temp. Range:	32° to 122° F (0 to 50° C)

MSC PROGRAMMING



MAIN PROGRAMMING SCREEN

Programmable by RS232 connection to an IBM compatible PC running Windows 3.1, Windows 95 or Windows NT. Programming software and cable included. Programming is very easy to learn and requires no previous programming experience.

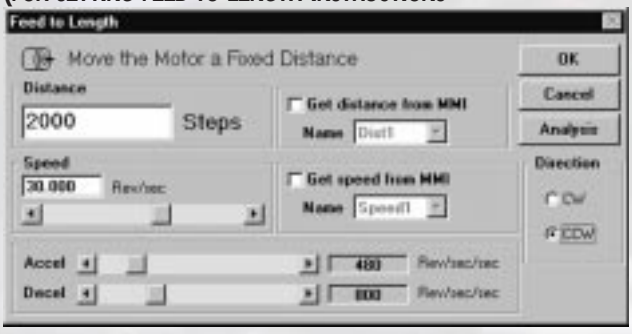
Programs can be up to 100 lines long. Instructions are powerful, so 100 lines can provide the user with a sophisticated program. For example, in one program line the motor can be moved until a sensor changes state, then fed a precise distance to stop, delayed and returned to the starting point. Distances, delays, feed and return speeds, acceleration and deceleration parameters are all included in the single program instruction. The same move can take 10 program lines or more on other indexers. There are a total of 13 different instructions, including input/output, branches, loops and motion commands. These instructions can be combined to make a nearly infinite variety of programs, meeting the demands of a wide range of applications.

The main programming screen is shown above. On the right of the screen are the 100 program lines. In the center are command buttons and on the left are global parameters such as microstep resolution and jog. Clicking on a program step icon brings up a sequence of dialog boxes, making program selection and parameter setting easy.

Once programmed, the cable can be removed and the indexer-drive will run stand alone. Programs and parameters are stored internally in non-volatile memory. Upon power up, the drive automatically senses the connection to the Windows programming software. If no connection is detected, the program is automatically executed starting on line 1.

The MSC also allows program interaction to take place using the PIT user interface (page 124).

TYPICAL DIALOG BOX
(FOR SETTING FEED TO LENGTH INSTRUCTIONS

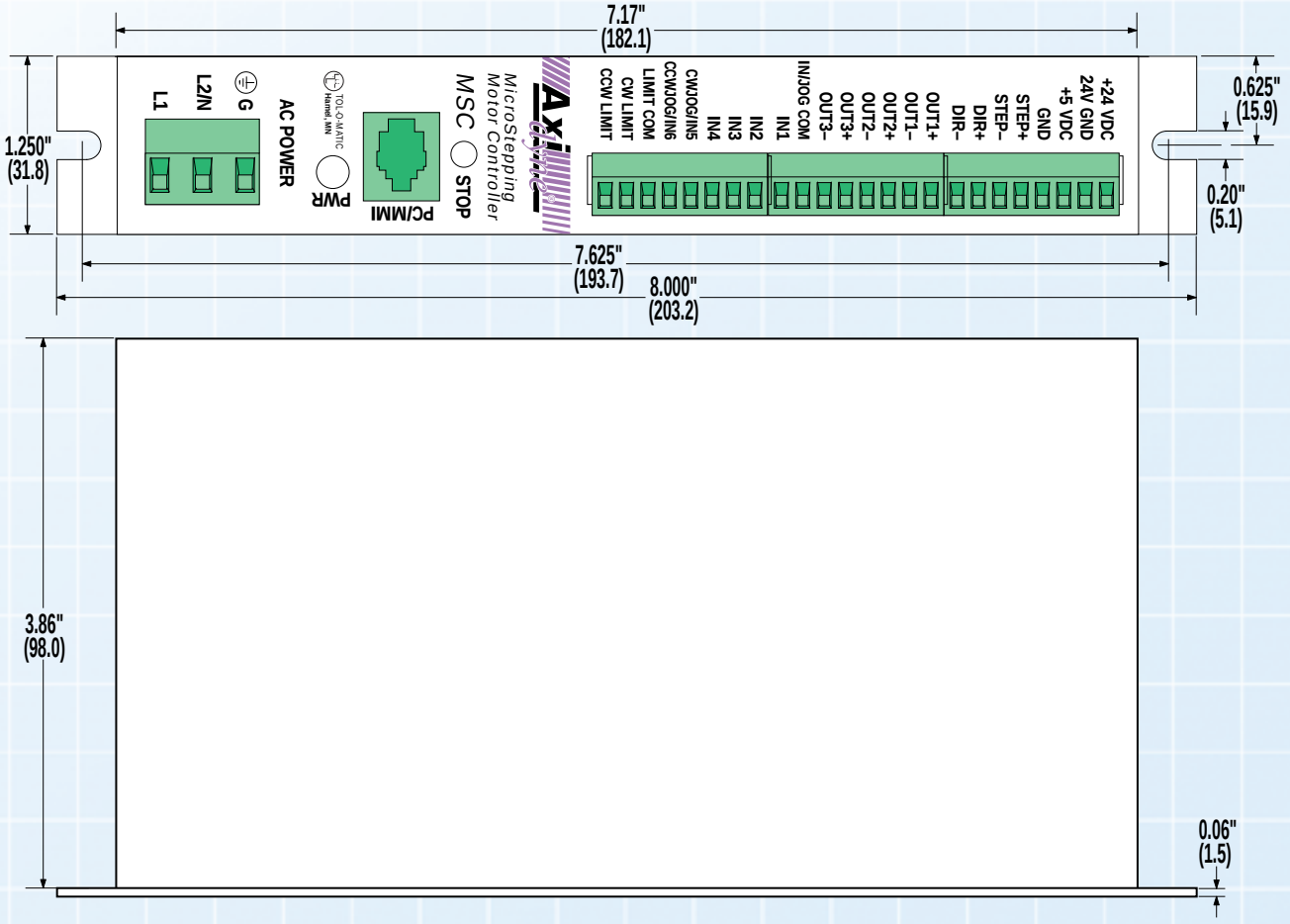


THE COMMAND BUTTON FEATURES INCLUDE:

- DOWNLOAD PROGRAM TO DRIVE
- UPLOAD PROGRAM FROM DRIVE
- EXECUTE PROGRAM
- SAVE PROGRAM TO DISK
- LOAD PROGRAM FROM DISK
- PRINT PROGRAM
- QUIT THE PROGRAMMING SOFTWARE

DIMENSIONS

MSC MICROSTEPPING CONTROLLER



Tol-O-Matic System Compatibility

- Provides control for SSD Brushless Servo Drive
- PIT (Panel Mount User Interface)

Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
MSC	• Microstepping Controller • 7ft. RS232 Cable • User Manual • Tol-O-Motion MSC Software	3600-0040

CONTROLLER/DRIVE COMBINATIONS

Axidyne controller/drive combinations are available for microstepper and brushed dc systems. These controller/drives combine flexibility and superior performance in compact packages

STEPPER

BRUSHED DC

MSCLDC Brushed DC Servo Controller/Driver

For use with Axidyne MRB motors, for applications that require a servo system, without the expense of brushless motors.

MSS Microstepping Controller/Driver

For use with Axidyne MRS motors, this stand alone unit is the simplest and most cost effective way to provide single axis motion to Tol-O-Matic's stepper motor/ actuator systems.

DM5/6C Open Loop Brushed DC Controller/ Drive Module

For use with Axidyne MRB motors, this low cost controller/drive module is intended for systems that do not require position feedback.

MSS MICROSTEPPING CONTROLLER/DRIVER

FEATURES • SPECIFICATIONS • PROGRAMMING • DIMENSIONS • ORDERING

Tol-O-Matic's MSS stand alone microstepping controller/drive system is absolutely the simplest and most cost-effective way to provide single axis motion to Tol-O-Matic's stepper motor/actuator systems. The Tol-O-Motion MSS software allows sophisticated programming to be achieved by even the most novice user, through icons arranged in a simple, easy to follow format. Once programmed over the RS232 the PC may be removed and program interaction achieved through I/O or the PIT (Panel Mount Interface).

STEPPER

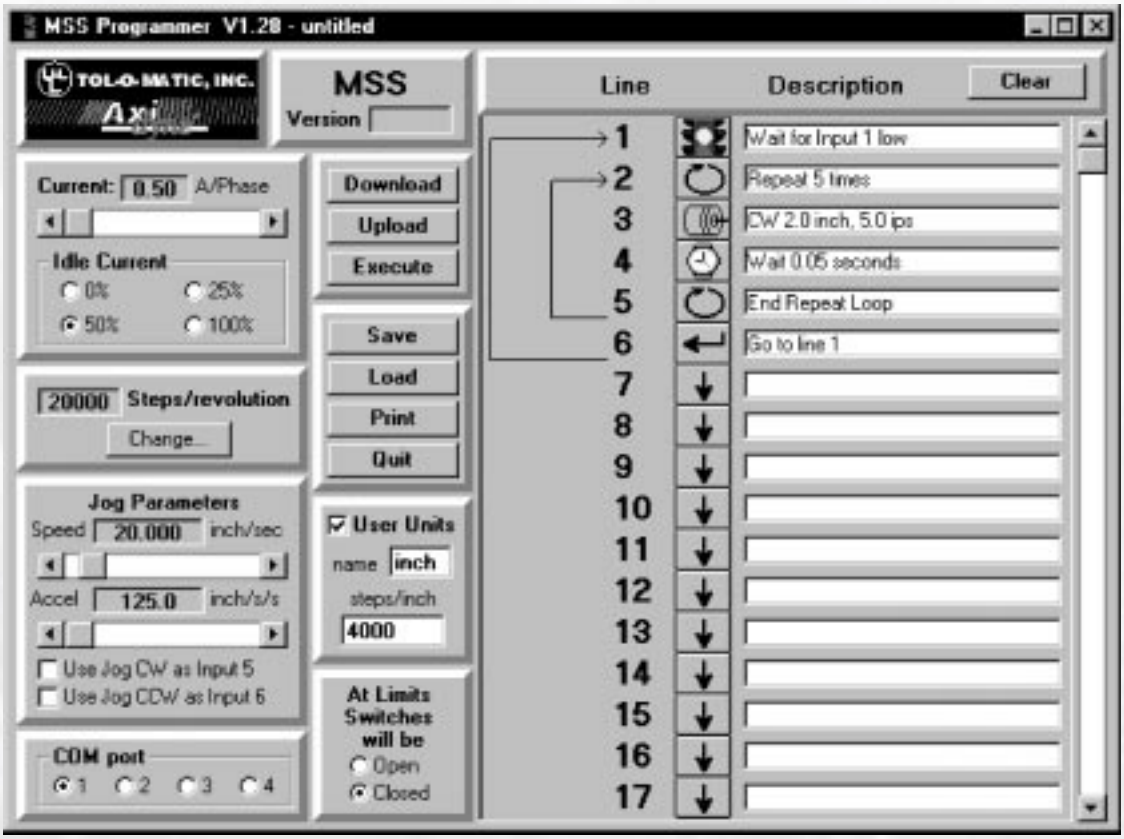
Features:

- ***Motor Current: 0.5 to 5.5 amps/phase,*** (software selectable)
- ***Drive Voltage: 80 VDC*** (from internal linear, toroidal power supply)
- ***Input Voltage: 110 or 220 VAC*** (switch selectable)
- ***Microstep Resolution: 13 resolutions,*** 2000 to 50800 steps/revolution (software selectable)
- ***Automatic idle current reduction:*** 0%, 25%, 50% or 100% (software selectable)
- ***Connectors:*** *pluggable,* screw terminal connectors are included.
- ***Two dedicated, optically isolated limit switch inputs,*** 5 - 24 VDC
- ***CW and CCW jog inputs***
- ***Four general purpose, filtered inputs***
- ***Drive fault output*** (activated by overcurrent or over-temperature condition)
- ***3 general purpose, optically isolated outputs*** for interfacing to other equipment
- ***Uses Tol-O-Motion MSS Software***

SPECIFICATIONS

SPECIFICATIONS	MSS Microstepping Controller/Driver
Power	
Input Current (AC line):	Varies with motor & load 6.0A max. at 110 Vac
Input Voltages (AC line):	110 or 220 Vac, 50-60Hz (switch selected)
Input Fuses (AC line):	6.3A time lag, TR5 style
Motor Current Output:	0.5 - 5.5 A / phase peak
Internal Bus Voltage:	80 Vdc (unregulated)
Parameter Ranges	
Distance:	1 to 16,000,000 steps
Speed:	.025 to 50 revolutions per second (in any microstep resolution)
Acceleration:	1 to 3000 rev/sec/sec
Deceleration:	1 to 3000 rev/sec/sec (set independently from acceleration)
Time Delays:	0.1 to 25.5 seconds
Microstep Resolution:	2000-50800 steps/rev
Inputs	
Input Current - Input 1-4, CW Jog, CCW Jog:	5 mA (internally pulled up to 5 Vdc)
Input Current - CW Limit, CCW Limit:	5 - 15 mA (internally limiting resistor for 5v logic)
Outputs	
Outputs 1-3:	Optically isolated, 24 Vdc max, 100mA
5V Output:	±5%, 100mA max, self resetting fuse 50 mA used by PIT (if connected)
Environment	
Maximum Case Temp.:	167° F (75° C)
Ambient Temp. Range:	32° to 113° F (0 to 45° C)

MSS PROGRAMMING



MAIN PROGRAMMING SCREEN

Programmable by RS232 connection to IBM compatible PC running Windows 3.1, Windows 95 or Windows NT. Programming software and cable included. Programming is very easy to learn and requires no previous programming experience.

Programs can be up to 100 lines long. Instructions are powerful, so 100 lines can provide the user with a sophisticated program. For example, in one program line the motor can be moved until a sensor changes state, then fed a precise distance to stop, delayed and returned to the starting point. Distances, delays, feed and return speeds, acceleration and deceleration parameters are all included in the single program instruction. The same move can take 10 program lines or more on other indexers. There are a total of 13 different instructions, including input/output, branches, loops and motion commands. These instructions can be combined to make a nearly infinite variety of programs, meeting the demands of a wide range of applications.

The main programming screen is shown above. On the right of the screen are the 100 program lines. In the center are command buttons and on the left are global parameters such as microstep resolution and jog. Clicking on a program step icon brings up a sequence of dialog boxes, making program selection and parameter setting easy.

Once programmed, the cable can be removed and the indexer-drive will run stand alone. Programs and parameters are stored internally in non-volatile memory. Upon power up, the drive automatically senses the connection to the Windows programming software. If no connection is detected, the program is automatically executed starting on line 1.

The MSS also allows program interaction to take place using the PIT user interface (page 124).

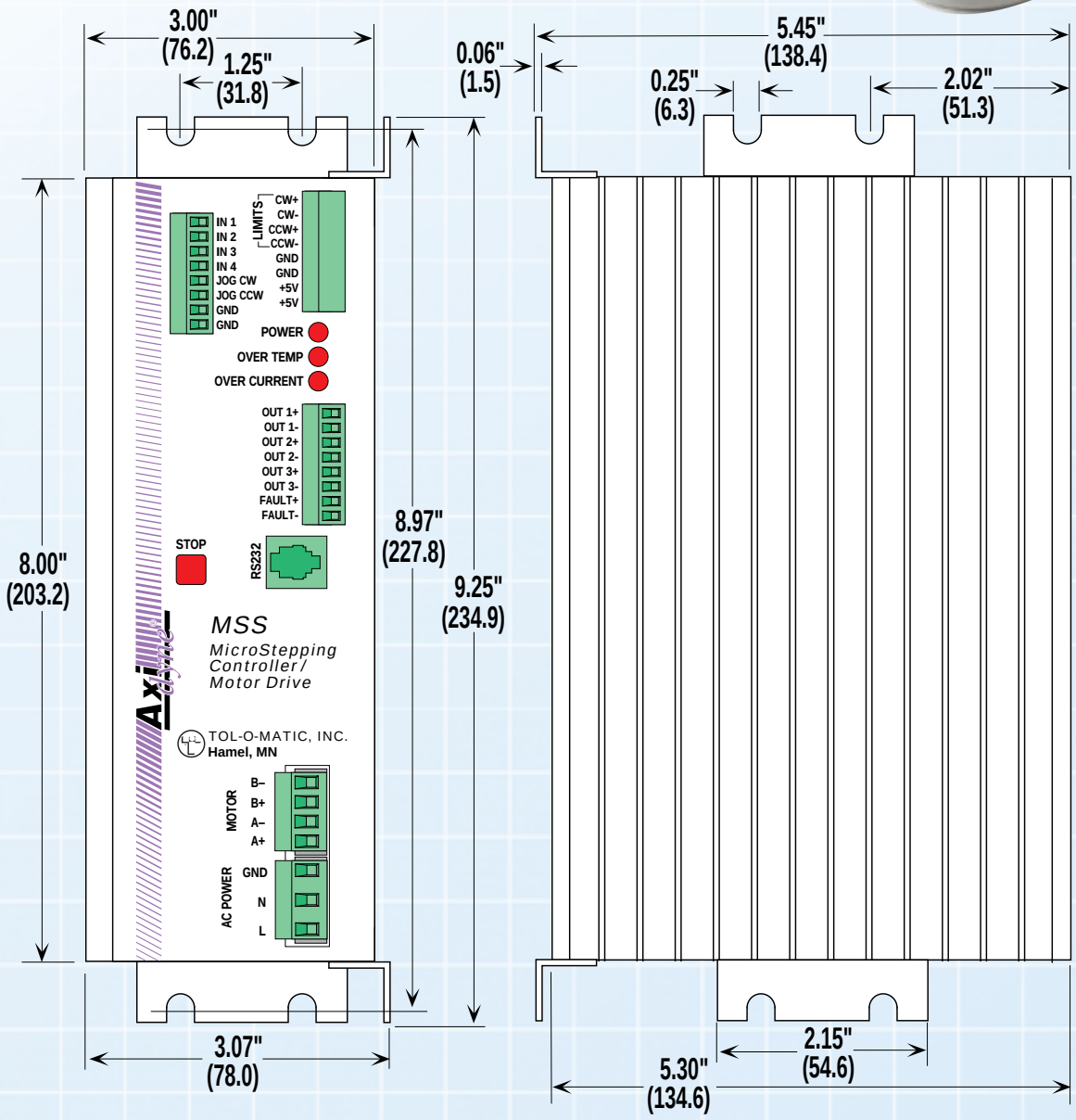
TYPICAL DIALOG BOX
(FOR SETTING FEED TO LENGTH INSTRUCTIONS

THE COMMAND BUTTON FEATURES INCLUDE:

- DOWNLOAD PROGRAM TO DRIVE
- UPLOAD PROGRAM FROM DRIVE
- EXECUTE PROGRAM
- SAVE PROGRAM TO DISK
- LOAD PROGRAM FROM DISK
- PRINT PROGRAM
- QUIT THE PROGRAMMING SOFTWARE

DIMENSIONS

MSS MICROSTEPPING CONTROLLER/DRIVER



Tol-O-Matic System Compatibility

- Drives MRS series stepper motors to provide motor./drive system performance shown in the MRS motor section (pages 55-56)
- PIT (Panel Mount User Interface)

Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
MSS	• Microstepping Drive & Controller • 7ft. RS232 Cable • User Manual • Tol-O-Motion MSS Software	3600-9603

MSCLDC MICROSTEPPING CONTROLLER/ BRUSHED DC SERVO MOTOR DRIVER

FEATURES • SPECIFICATIONS • PROGRAMMING • DIMENSIONS • ORDERING

The MSCLDC provides a low cost single axis controller and brushed dc servo drive in one package, for those applications that do not justify significantly more expensive brushless systems. Setup and programming is performed with the Tol-O-Motion MSCLDC software, allowing sophisticated programming to be achieved by even the most novice user, through icons arranged in a simple easy to follow format. Once programmed over the RS232, the PC may be removed and program interaction achieved through I/O or the PIT (Panel Mount User Interface).

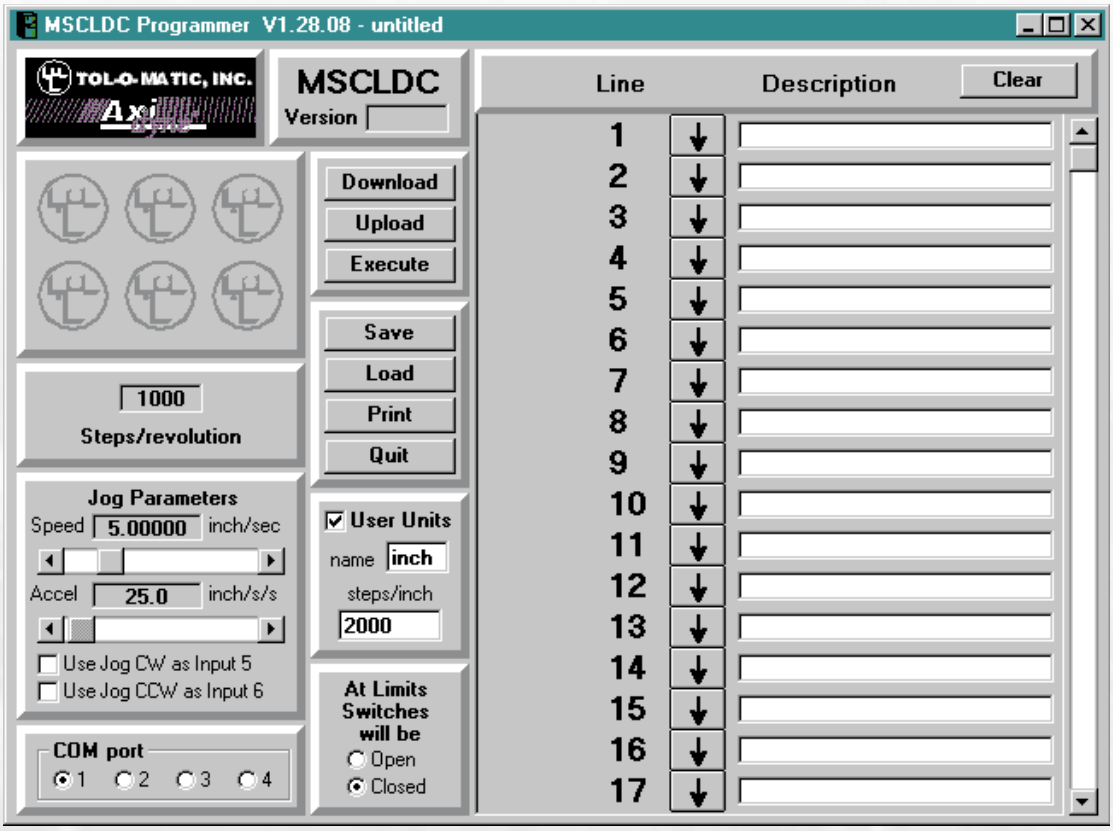
Features:

- ***10 Amp power supply***
- ***Position feedback*** accomplished via a two channel (A&B) differential incremental encoder
- ***Proportional + Derivative (PD) feedback loop*** for closing the loop around the motor
- ***Line fuse protection***
- ***Final position error of +/- 3 encoder counts***
- ***Repeatability*** of ± 1 encoder count
- ***Position error L.E.D.*** (± 127 encoder counts) and current trip faults
- ***Current trip point potentiometer*** for setting torque fault limit
- ***Fault conditions via solid state Form "C" output*** (position error and current trip)
- ***Fault condition indication via 2 L.E.D.s*** to indicate current trip and position error faults for field diagnostics
- ***Opto-isolated external power*** (Vdc I/O).
- ***Potentiometer for Damping and Gain adjustment***
- ***Four dedicated, optically isolated inputs***: CW & CCW jog, 2 limits
- ***Four general purpose, optically isolated inputs***
- ***Three general purpose, optically isolated outputs***

SPECIFICATIONS

SPECIFICATIONS	MSCLDC Microstepping Controller/ brushed DC Servo Motor Driver
Power	
Input Voltages:	85 - 132 Vac (European input power available on request as a modification)
Input Frequency:	60 Hz
Input Current:	7 Amp (max.)
Output Voltage (DC line):	48 Vdc (no-load condition)
Output Continuous Current:	10 Amp
Output Peak Current:	15 Amp (1 second operating at peak condition)
Performance	
System Resolution:	1000 counts per revolution
Repeatability:	± 1 encoder count
Final Position Accuracy:	± 3 encoder counts
P.W.M. Frequency:	20 KHz
Over Current Rating:	125% of continuous rating
Parameter Ranges	
Distance:	1 to 16,000,000 steps
Speed:	.025 to 50 rev/sec
Acceleration:	1 to 3000 rev/sec/sec
Deceleration:	1 to 3000 rev/sec/sec (independent of acceleration)
Time Delays:	0.1 to 25.5 seconds
Inputs	
INPUT CURRENT - Input 1-4, CW Jog CCW Jog:	5 mA (internally pulled up to 5 Vdc)
INPUT CURRENT - CW Limit, CCW Limit:	5 - 15 mA (internal limiting resistor for 5 V logic)
Potentiometer Inputs	
Current Trip:	Adjustment of Torque Fault Limit
Gain:	Position error adjustment between commanded and actual feedback signals
Damping:	System setting time adjustment between the system natural frequency and operating frequency
Outputs	
Outputs 1-3	Optically isolated, 24 Vdc max., 100 mA
5V Output	±5%, 100 mA max, self resetting fuse
Environment	
Ambient Temp. Range:	32° to 113° F (0 to 45° C)

MSCLDC PROGRAMMING



MAIN PROGRAMMING SCREEN

Programmable by RS232 connection to IBM compatible PC running Windows 3.1, Windows 95 or Windows NT. Programming software and cable included. Programming is very easy to learn and requires no previous programming experience.

Programs can be up to 100 lines long. Instructions are powerful, so 100 lines can provide the user with a sophisticated program. For example, in one program line the motor can be moved until a sensor changes state, then fed a precise distance to stop, delayed and returned to the starting point. Distances, delays, feed and return speeds, acceleration and deceleration parameters are all included in the single program instruction. The same move can take 10 program lines or more on other indexers. There are a total of 13 different instructions, including input/output, branches, loops and motion commands. These instructions can be combined to make a nearly infinite variety of programs, meeting the demands of a wide range of applications.

The main programming screen is shown above. On the right of the screen are the 100 program lines. In the center are command buttons and on the left are global parameters such as microstep resolution and jog. Clicking on a program step icon brings up a sequence of dialog boxes, making program selection and parameter setting easy.

Once programmed, the cable can be removed and the indexer-drive will run stand alone. Programs and parameters are stored internally in non-volatile memory. Upon power up, the drive automatically senses the connection to the Windows programming software. If no connection is detected, the program is automatically executed starting on line 1.

The MSCLDC also allows program interaction to take place using the PIT user interface (page 124)

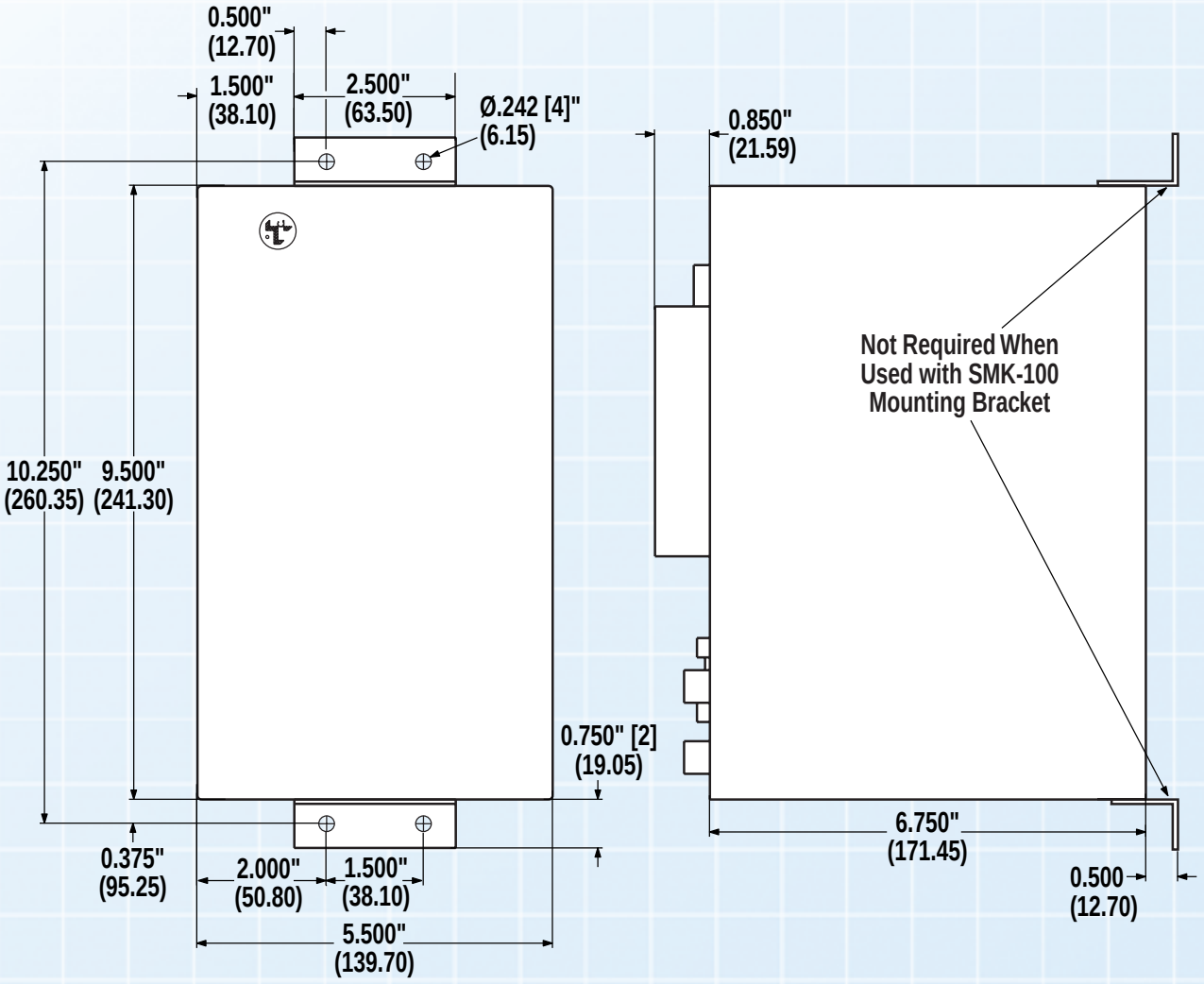
TYPICAL DIALOG BOX
(FOR SETTING FEED TO LENGTH INSTRUCTIONS

THE COMMAND BUTTON FEATURES INCLUDE:

- DOWNLOAD PROGRAM TO DRIVE
- UPLOAD PROGRAM FROM DRIVE
- EXECUTE PROGRAM
- SAVE PROGRAM TO DISK
- LOAD PROGRAM FROM DISK
- PRINT PROGRAM
- QUIT THE PROGRAMMING SOFTWARE

DIMENSIONS

MSCLDC MICROSTEPPING CONTROLLER/BRUSHED DC SERVO MOTOR DRIVER



BRUSHED DC

Tol-O-Matic System Compatibility

- Drives MRB series brushed DC Servo Motors to provide motor/drive system performance shown in the MRB motor section (see pages 57-62)
- PIT (Panel Mount User Interface)

Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
MSCLDC	• Microstepping Controller/ brushed DC Servo Motor Driver	3600-0037
	• 7ft. RS232 Cable	
	• User Manual	
	• Tol-O-Motion MSCLDC Software	

DM5C & DM6C OPEN LOOP BRUSHED DC CONTROLLER/DRIVER

FEATURES • SPECIFICATIONS • DIMENSIONS • ORDERING

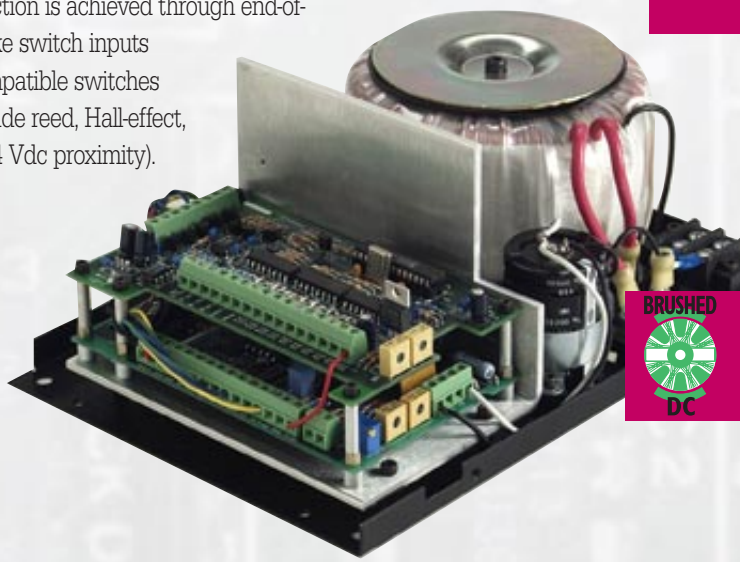
SPECIFICATIONS

DM_C Open Loop Brushed DC Controller/Driver

Basic Controller Inputs	
Decel CW/CCW:	Limit switch inputs for accel/decel profile
Accel CW/CCW:	Starts move after end-of-move dwell
Brake CW/CCW:	Limit switch inputs to provide braking profile
Home CW/CCW:	Initiates home move after power-up or reset
Reset 1, 2:	Open connection clears fault
0 - 10V:	0-10 vdc analog speed signal input
0 - 5V:	0-5 vdc analog speed signal input
4 - 20 mA:	4 - 20 mAdc analog input
Basic Controller Outputs	
EOM CW / CCW:	Defines start and end of end-of-stroke
Fault Out:	Trip indicator (Outputs are open collector for sinking up to 50 mAdc at 50 Vdc max.)
Basic Controller Outputs (to dc Drive)	
Accel/Decel:	to On/Off input
Brake :	to Brake input
CW/CCW:	to FWD/REV input
Speed:	to Speed input
Reset 1, 2:	to Reset 1, 2
Dwell at End-of-Stroke	
Potentiometer:	25 turn potentiometer to set dwell times at each end
Max Dwell Time:	Up to 5 seconds
Drive Power	
Input Current (AC line):	115 Vac/60 Hz (85-128 Vac range)
Output Voltage:	DM5: 32 Vdc; DM6: 48 Vdc
Continuous Current:	DM5: 15 Amp; DM6: 10 Amp
Peak Current:	DM5, DM6: 30 Amp (5 millisecond rating)
Max. Power:	DM5, DM6: 480 Watts
P.W.M	
Frequency:	20 kHz
% P.W.M. vs Potentiometer:	0% PWM @ 1.5 Vdc to
Voltage Reference:	100% PWM @ 4.1 Vdc
Auxiliary Speed Control	
Potentiometer Range:	10K Ω range for externally provided potentiometer (included with drive)
Analog input:	1.5 to 4.1 Vdc
Accel./Deceleration Range:	0 to 7.0 seconds
Over-Current Trip Setting	
Potentiometer:	25 turn potentiometer adjustable to 125% of rating
Delay:	0.2 second delay / self adjusting for accel.
Environment	
Temperature Range:	32° to 122° F (0° to 50° C)
Humidity:	10 - 95% non-condensing
Reset:	Normally closed momentary reset input.
Fault Indicator	
L.E.D.:	on Drive
OUTPUT:	for external L.E.D.
Drive Module Optically-Isolated Inputs•	
On/Off:	Initiates acceleration or deceleration profile
Brake:	Stopping of motor with dynamic braking
Fwd/Rev:	Reversing motor direction
Enable:	Disabling or enabling power to the drive Fault Reset - Clears current trip fault

•Dc voltage supply (5 to 25 Vdc/25 mA. max.) required to power Drive Module opto-isolation when NOT used with Basic Controller Module.

Consisting of an Axidyne Controller and an Open Loop DC Drive Module, (DM5C, DM6C) provides a cost-effective means of providing continuous reversing motion control. End-of-stroke dwell times are independently adjustable while an external potentiometer (included with drive) can provide variable speed control. Change of direction is achieved through end-of-stroke switch inputs (compatible switches include reed, Hall-effect, or 24 Vdc proximity).



BRUSHED DC

DC Drive Features:

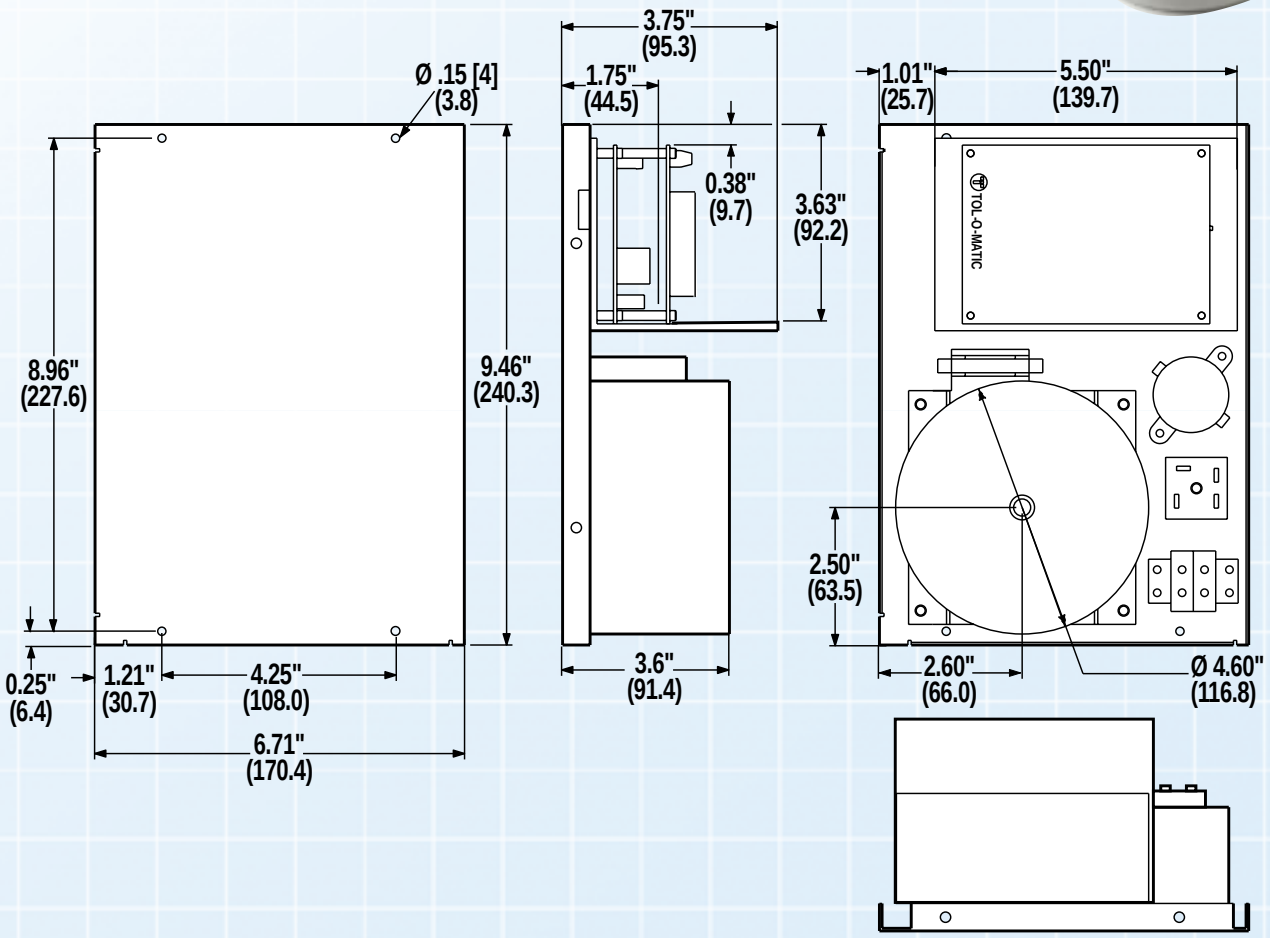
- ***Choice of two power rating configurations*** (matched to Axidyne dc motor ratings)
- ***Self resetting fuse*** for dc supply to drive
- ***Optional solid state dynamic braking circuitry*** for accuracy and consistency
- ***Lockout fault protection*** for dc power supply under voltage
- ***Adjustable current limit detection*** for over current (overload condition) protection
- ***Fault condition*** (lock out) output for L.E.D.
- ***L.E.D. status indicators***
- ***Independent acceleration and deceleration adjustment***

Controller Features:

- ***Operating Modes:*** *A)* Continuous cycle end-to-end with independently adjustable dwell (0.05 to 5 sec.) at each end; *B)* Single complete cycle (both directions) in response to start command; *C)* Single direction move in response to direction command
- ***Predictable first move direction for all modes.*** Hook-up of limit switches selects move profile: A) Accel / Decel; B) Accel / Brake: C) Accel / Decel-Brake
- ***Different profiles can be used for each direction***
- ***Homing function*** after power-up or reset
- ***Accepts analog speed signal inputs*** and provides isolation (0-10V, 0-5V, 4-20mAdc)

DIMENSIONS

DM5C & DM6C BRUSHED DC CONTROLLER/DRIVER



BRUSHED DC

Tol-O-Matic System Compatibility

- Drives MRB series DC brush motors to provide motor/drive system performance shown in the MRB motor section (see pages 57-62)

Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
DM5C	• Open Chassis Brush Servo Motor Drive • User Manual	3600-0106
DM6C	• Open Chassis Brush Servo Motor Drive • User Manual	3600-0107

DRIVES

Axidyne drives are available for brushless servo, microstepping and brushed dc systems. These drives combine flexibility and superior performance in compact packages

SSD Brushless Servo Drive

For use with Axidyne MRV motors, this servo drive provides continuous torques up to 44in.-lbs. (4.97 N-m) in a 34 frame, 15.6 in-lbs. (1.76 N-m) in a 23 frame.

DMCLDC Brushed DC Servo Motor Driver

For use with Axidyne MRB motors, for applications that require a servo system, without the expense of brushless motors.

MSD Microstepping Motor Drive

For use with Axidyne MRS motors, this stand alone microstepping drive is an economical solution for use within multi-axis stepper applications.

DM5/6 Open Loop Brushed DC Drive Module

For use with Axidyne MRB motors, this low-cost drive module is intended for systems that do not require position feedback.

SSD BRUSHLESS SERVO DRIVE

FEATURES • SPECIFICATIONS • DIMENSIONS • ORDERING

The SSD digital brushless servo drive combines flexibility and superior performance in a very compact package. With three output power ratings available, continuous torques up to 44 in-lbs. (4.97 N-m) in a 34 frame, and 15.6 in-lbs. (1.76 N-m) in a 23 frame are achievable when used in conjunction with the Tol-O-Matic MRV series brushless servo motors.

Features:

- ***Drive MRV series brushless servo motors***
- ***Continuous output ratings of 0.5 kW*** (SSD5), 1.0 kW(SSD10), 2.0 kW (SSD20)
- ***Superior performance and functionality*** to drives over twice the size
- ***Accepts either ± 10V analog or step/direction command signal***
- ***Auxiliary master encoder*** input with electronic gearing
- ***8 preset positions/speeds/torques*** selected via 3 digital input lines
- ***RS232/485 communications***
- ***Point and click software*** for setup and control, displays and diagnostics
- ***Digital autotuning*** for quick setup
- ***4 dedicated I/O plus 5 user-selectable optically isolated digital inputs and outputs*** (sourcing/active high)
- ***Internally shielded output filter*** for electromagnetic compatibility (EMC)
- ***1 analog input*** for external current limit
- ***1 analog output*** for variable monitoring or torque sharing
- ***UL, cUL listed and CE marked***

Note: the use of an external ac line filter and appropriately shielded cables are required for CE compliance.

Connectors

J1 - CONTROLLER

1	Encoder +5 V DC	2	Encoder Com
3	Encoder +5 V DC	4	Encoder Com
5	Isolated +24 V DC	6	Isolated +24 V Com
7	Motor Output Channel A+	8	Motor Output Channel A-
9	Motor Output Channel B+	10	Motor Output Channel B-
11	Motor Output Index +	12	Motor Output Index -
13	Isolated 24 V Com	14	Auxiliary Channel A+
15	Auxiliary Channel A-	16	Auxiliary Channel B+
17	Auxiliary Channel B-	18	Auxiliary Index A+
19	Auxiliary Index A-	20	Drive Enable
21	Fault Reset	22	Analog Cmnd +
23	Analog Cmnd -	24	Drive Ready +
25	Drive Ready -	26	Isolated +24 V DC
27	Positive Current Limit	28	Analog Com
29	Negative Current Limit	30	Analog Output 1
31	Analog Output 2	32	Selectable Input 1

J1 - CONTROLLER (CONT.)

33	Selectable Input 2	34	Selectable Input 3
35	Selectable Input 4	36	RSVD
37	RSVD	38	RSVD
39	RSVD	40	RSVD
41	RSVD	42	Selectable Output 1
43	Selectable Output 2	44	Selectable Output 3
45	Selectable Output 4	46	RSVD
47	RSVD	48	RSVD
49	Brake Enable +	50	Brake Enable -

J2 - ENCODER

1	Encoder Pwr	2	Encoder Com
3	Encoder Pwr	4	Encoder Com
5	Encoder Pwr Sense +	6	Encoder Pwr Sense -
7	Motor Encoder Input Chnl A+		
8	Motor Encoder Input Chnl A-		

J2 - ENCODER (CONT.)

9	Motor Encoder Input Chnl B+		
10	Motor Encoder Input Chnl B-		
11	Motor Encoder Input Chnl I+		
12	Motor Encoder Input Chnl I-		
13	Hall A	14	Hall B
15	Hall C	16	Absolute Position
17	RSVD	18	RSVD
19	Thermal Switch +	20	Thermal Switch -

J3 - SERIAL PORT

1	RCV+	RS-485	2	RCV	RS-232
3	XMT	RS-232	4	XMT+	RS-485
5	COM		6	RSVD	
7	RCV-	RS-485	8	XMT-	RS-485
9	RSVD				

SPECIFICATIONS

SPECIFICATIONS	SSD Brushless Servo Drive		
Power	**SSD5**	**SSD10**	**SSD20**
Peak Output Current:	7.5 Amps	15 Amps	30 Amps
Continuous Output Current:	2.5 Amps	5 Amps	10 Amps
Continuous Output Power:	0.5 kW	1.0 kW	2.0 kW
Continuous Input Current:	5 Amps	9 Amps	18 Amps
Input Voltage:	100 to 240 Vac RMS nominal		
Input Frequency:	47 to 63 Hz		
Command Sources			
Analog Velocity Input:	± 10 V		
Step and Direction, Step Up/ Step Down:	1 MHz maximum frequency Differential or single ended line drivers		
Master Encoder Following:	1 MHz maximum frequency Differential or single ended line drivers		
Serial Communication Port			
Type:	RS232, four-wire RS485		
Baud Rate:	1200 to 19,200 baud		
Multiple Drive Addressing:	Up to 32 drives		
Control Loops			
Modes:	Torque, velocity and position control		
Type:	All loops digital		
Velocity Loop Bandwidth:	300 Hz (maximum)		
Inputs and Outputs			
Selectable Digital Inputs:	3 optically isolated, 24 Volt, active high User-selectable as: Drive Mode Select, Integrator Inhibit, Follower Enable, Forward Enable, Reverse Enable, Preset Select, Analog Override		

SPECIFICATIONS	SSD Brushless Servo Drive
Selectable Digital Outputs:	2 optically isolated, 24 Volt, active high User-selectable as: In Position, Within Position Window, Zero Speed, Within Speed Window, At Speed, Current Limit, Drive Enable, Bus Charged, various fault indications
Dedicated Relay Inputs:	Enable, Fault Reset (Optically isolated, 24 Volt, active high)
Dedicated Relay Outputs:	Ready/Not Faulted, Brake Output
Analog Inputs:	1 external analog current limit, 0 to 10 Volt
Analog Outputs:	1 user programmable, ±10 Volt
Encoder Output:	1 MHx maximum line frequency Differential Line Drivers Scalable by 1, 1/2, 1/4 1/8
Motor Feedback:	Incremental encoder
Connectors	
Serial:	9 pin D-Shell
Control and Feedback:	20 and 50 pin high density Mini D
Power:	Screw terminal block
Environmental	
Storage Temperature:	-40°C to 70°C
Operating Temperature:	-5°C to 55°C
Humidity:	5% to 90%, non-condensing
Altitude:	1500m / 5000 ft.
Vibration:	10 to 2000 Hz at 2g
Shock:	15 g 11 msec half sine
Weight:	SSD5 3.7 lbs. *1.68 kg.* / SSD10 4.47 lbs. *2.03 kg.* / SSD20 4.41 lbs. *2.0 kg.*

Tol-O-Matic System Compatibility

- Drives MRV series brushless servo motors to provide motor/drive system performance shown in the MRV motor section (see pages 51-55)
- Easily integrated to the MSC single axis basic controller or the SSC multi-axis/multi-function controller.

Ordering Information

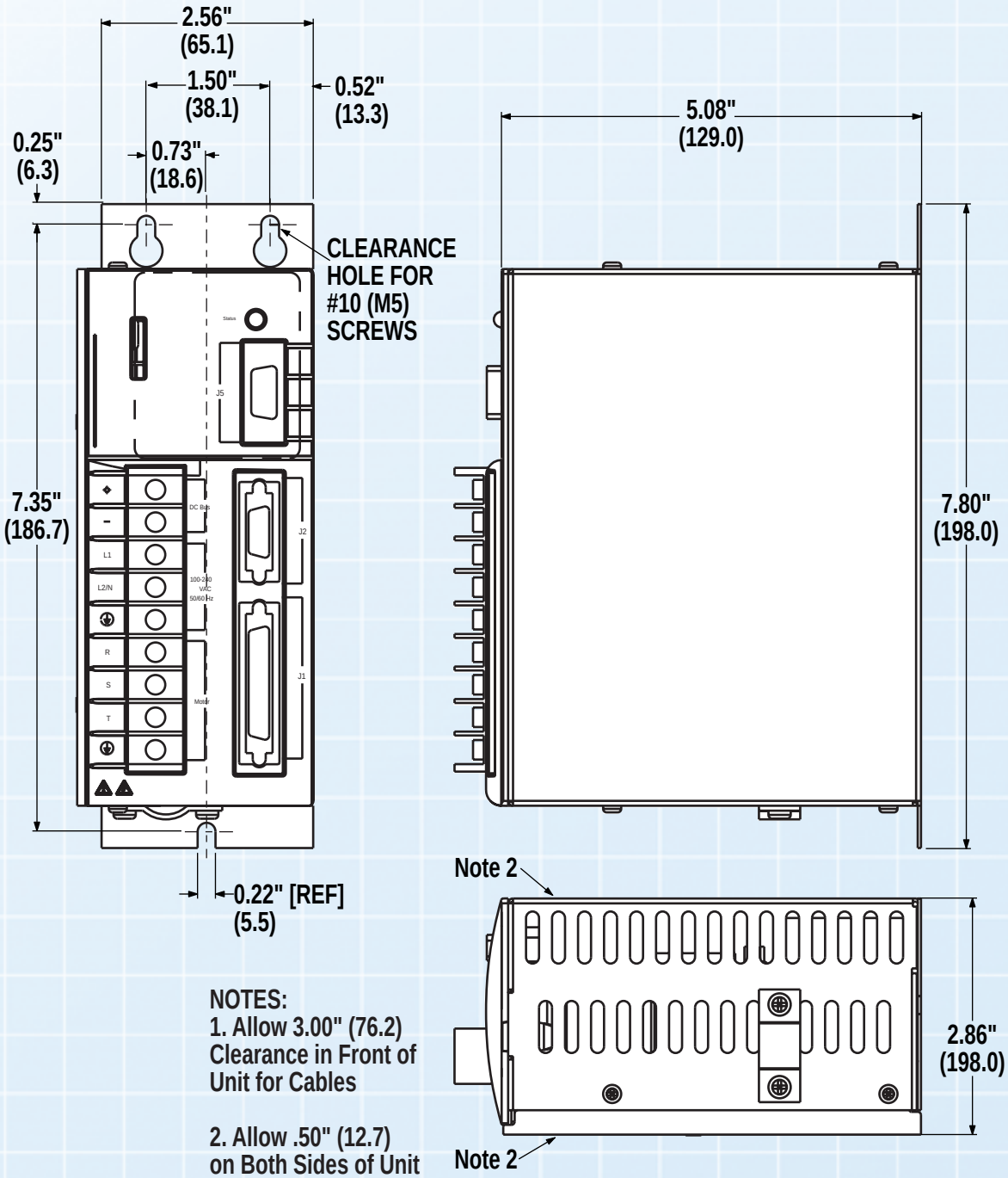
Configuration Code	Description	Length	Tol-O-Matic Part #
SSD5*	0.5 kW Drive		3600-0041
SSD10*	1.0 kW Drive		3600-0042
SSD20*	2.0 kW Drive		3600-0043
CR2**	Encoder Cable	2m	3600-1162
CR4**	Encoder Cable	4m	3600-1163
CR6**	Encoder Cable	6m	3600-1164
	Controller Cable	4m	3600-1161
	MRV Motor Cable	6m	3600-1165

*** Includes RS232 cable, user manual and Tol-O-Motion SSD Software**

**** Choice of one length Encoder Cable with each SSD unit (priced separately)**

DIMENSIONS

SSD05 BRUSHLESS SERVO DRIVE

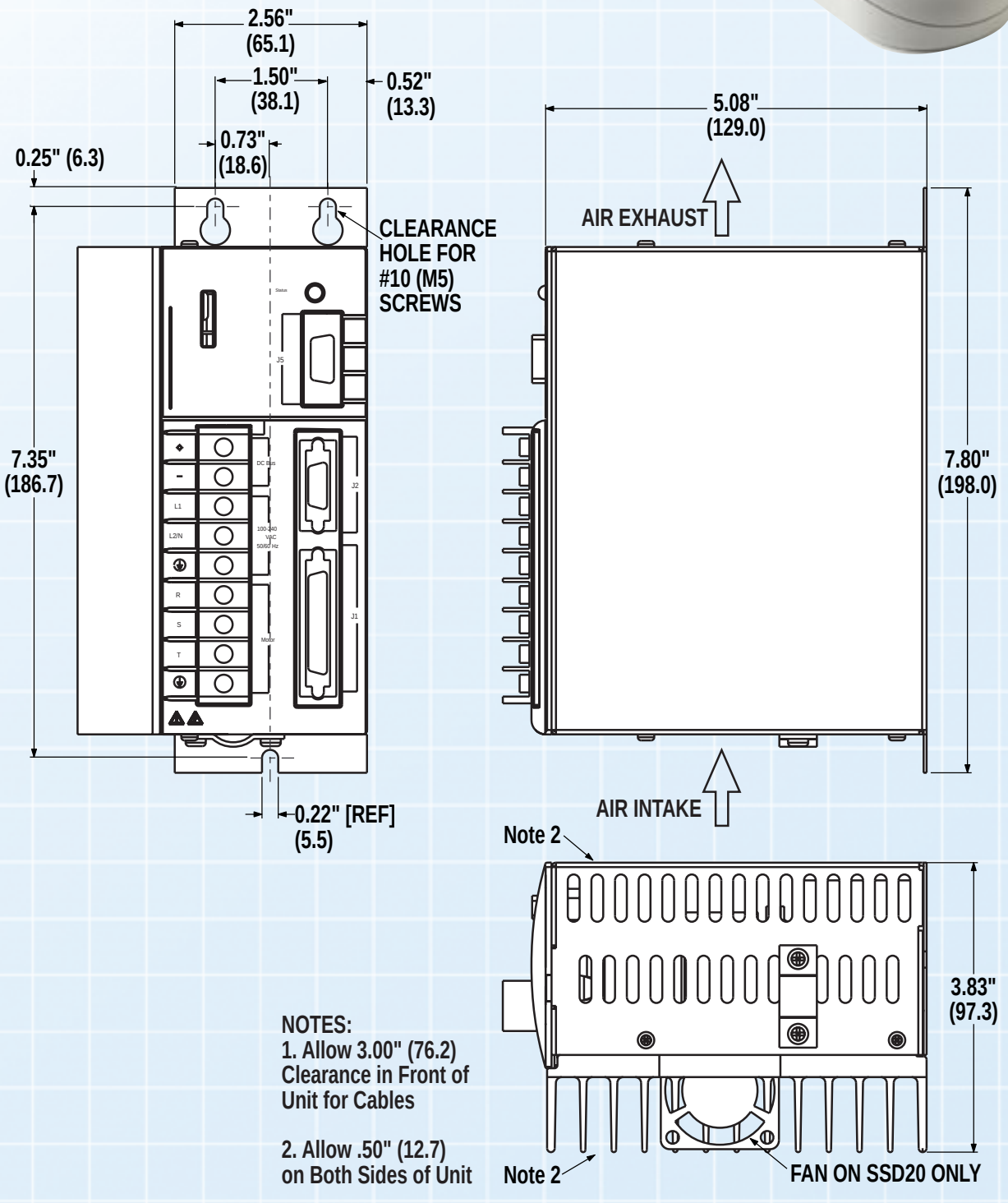


NOTES:
1. Allow 3.00" (76.2) Clearance in Front of Unit for Cables

2. Allow .50" (12.7) on Both Sides of Unit

DIMENSIONS

SSD10/SSD20 BRUSHLESS SERVO DRIVE



NOTES:
1. Allow 3.00" (76.2) Clearance in Front of Unit for Cables

2. Allow .50" (12.7) on Both Sides of Unit

MSD MICROSTEPPING MOTOR DRIVE

FEATURES • SPECIFICATIONS • DIMENSIONS • ORDERING

The MSD is a stand alone microstepping drive, making it a low cost solution for use within multi-axis stepper applications. With switch selectable current settings the MSD is the perfect drive for all of Tol-O-Matic's MRS high torque stepper motors.

Features:

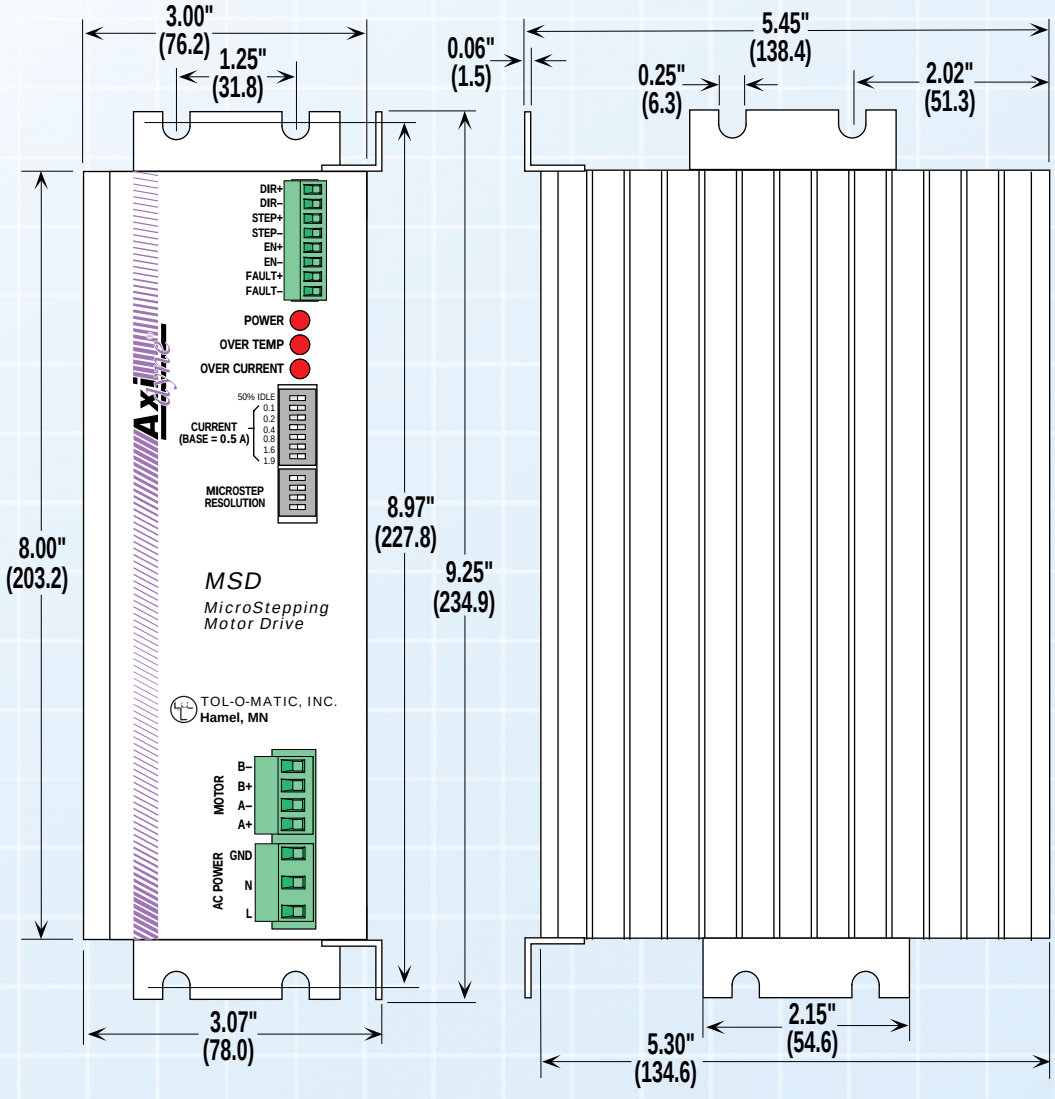
- ***Motor current from 0.5 to 5.5 amps/phase*** (switch selectable, 51 settings)
- ***Built-in 80 V power supply*** (accepts 110 or 220 VAC power)
- ***MOSFET pulse width modulation switching amplifiers*** (3 state)
- ***Step, direction, amplifier enable inputs, fault output, optically isolated***
- ***2 MHz max input frequency***
- ***16 switch selectable microstepping resolutions***: 200, 400, 1000, 2000, 5000, 10000, 12800, 18000, 20000, 21600, 25000, 25400, 25600, 36000, 50000, 508000,steps/rev
- ***Over-temperature protection***
- ***Short circuit protection***
- ***Surge protection***
- ***Idle current reduction*** (50% switch selectable)
- ***Pluggable screw terminal connectors***, mating connectors included
- ***Integral heat sink***

SPECIFICATIONS

SPECIFICATIONS	MSD Microstepping Motor Drive
Power	
Input Voltages (AC line):	110 or 220 Vac, 60Hz (switch selected) 400 W max (a 50/60Hz version can be special ordered)
Input Voltage (DC line):	75 Vdc full load, 90 Vdc no load
Amplifiers	
Pulse Width Modulated Switching:	Dual, MOSFET H-bridge, 3 state at 20 kHz
Phase Peak Output Current:	0.5 - 5.5 Amps
Output Power:	400 watts max
Protection:	Overcurrent and over-temperature
Automatic Idle Current Reduction:	Reduces current to 50% of setting after one second (defeatable)
Inputs	
Step, Direction & Enable:	Optically isolated differential 5-12V logic
Input Current:	5 mA minimum, 20 mA maximum
Motor Steps	on falling edge of step input
Minimum Pulse	1 µsec
Maximum Step Rate	2 MHz
Minimum Set Up Time:	1 µsec
Directional Signal Minimum Hold Time:	50 µs
Fault Output	
Photo Transistor:	Optically isolated, uncommitted (open collector, open emitter)
Voltage:	30V max.
Current	20 mA max.
Environment	
Max Case Temperature:	158° F (70° C)

DIMENSIONS

MSD MICROSTEPPING MOTOR DRIVE



Tol-O-Matic System Compatibility

- Drives MRS series stepper motors to provide motor/drive system performance shown in the MRS motor section (see pages 55-56)
- Easily integrated to the SSC multi-axis/multi-function controller (see pages 21-26). When ordering with controller all interconnecting cabling is automatically configured and included.
- Integral to single axis controller - (MSS see pages 31-33)
- Dip switch covers included
- Two (2) mounting brackets included

Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
MSD	• Microstepping Drive • User Manual	3600-0039

DMCLDC BRUSHED DC SERVO MOTOR DRIVER

FEATURES • SPECIFICATIONS • DIMENSIONS • ORDERING

The DMCLDC driver is the solution for applications that require a servo system, but do not justify significantly more expensive brushless motors and digital servo drivers. This driver was designed to drive the MRB series brushed DC motors configured with a 2 channel 500 line encoder to achieve positional accuracy of ±3 counts and repeatability of ± 1 count.

BRUSHED DC

Features:

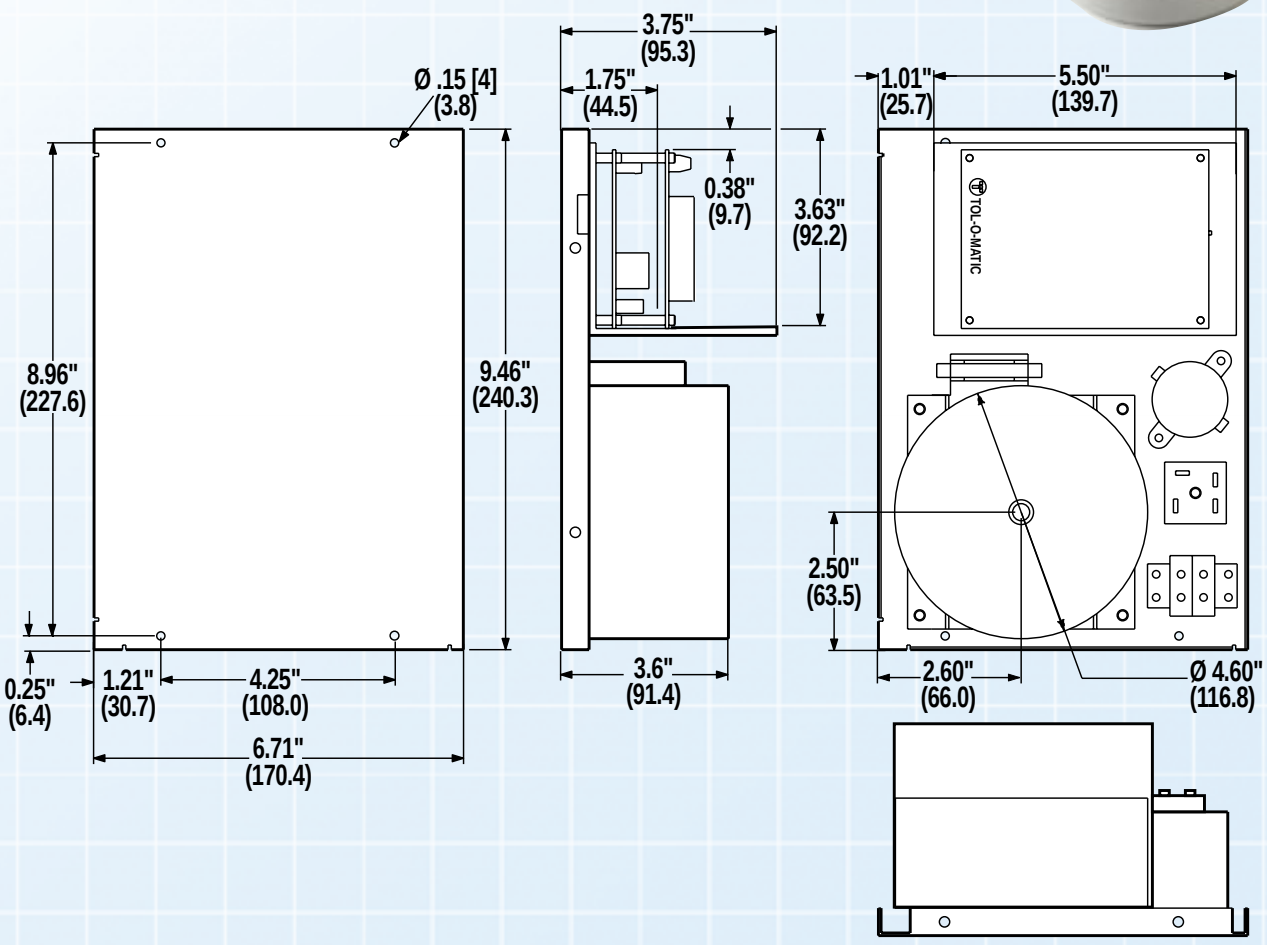
- ***10 Amp power supply***
- ***Line fuse protection***
- ***Position feedback*** accomplished via a two channel (A&B) differential incremental encoder for resolution of 1000 counts per revolution
- ***Proportional + Derivative (PD) feedback loop*** for closing the loop around the motor
- ***Final position error of ± 3 encoder counts***
- ***Repeatability of ± 1 encoder count***
- ***Position error L.E.D.*** (±127 encoder counts) and current trip faults.
- ***Current trip point potentiometer*** for setting torque fault limit
- ***Fault conditions via solid state Form "C" output*** (position error and current trip)
- ***Fault condition indication via 2 L.E.D.s*** to indicate current trip and position error faults for field diagnostics
- ***Opto-isolated inputs***, 5-30 Vdc (Pulse, Direction, Reset)
- ***Normally closed Reset input*** for clearing faults
- ***Pulse/Direction input*** for remote stepper controller

SPECIFICATIONS

SPECIFICATIONS	DMCLDC Brushed DC Servo Motor Driver
Power	
Input Current (AC line):	7.0 Amp max. (European Input power available on request as a modification)
Input Voltages (AC line):	85-132 Vac
Input Frequency:	60 Hz
Output Voltage:	48 Vdc (no-load condition)
Output Continuous Current:	10 Amp
Output Peak Current:	15 Amp (1 sec. operating at peak condition)
Performance	
System Resolution:	1000 counts per revolution
Repeatability:	±1 encoder count
Final Position Accuracy:	±3 encoder counts
P.W.M. Frequency:	20 KHz
Over Current Rating:	125% of continuous rating
Inputs - Pulse (Step and Direction Signal)	
Circuit:	Optically isolated; 1K Ohm input impedance
Input Current:	5 mA (min)
Input Voltage Low:	5 V (max)
Input Voltage High:	25 V (max)
Directional Input:	Direction changes on transition
Pulse (Step) Input:	Drive steps on positive going transition
Minimum Step Pulse Width:	10 microseconds
Max Frequency:	20 KHz
Reset:	Normally closed momentary contact for resetting faults
Encoder Resolution:	Jumper connection for selecting quadrature or full encoder pulse count
Potentiometer Inputs	
Current Trip:	Adjustment of torque fault limit
Gain:	Position error adjustment between commands and actual feedback signals
Damping:	System settling time adjustment between the system natural frequency and operating frequency
Outputs	
Fault Output:	Form C solid state relay output for position or current trip setting
Fault L.E.D. Output:	Diagnostic indication of current trip or position error
+5 Vdc L.E.D. Output:	Indicate power to CLDC Drive Module
Environment	
Ambient Temp. Range:	32° to 122° F (0 to 50° C)
Humidity:	10-95% non-condensing

DIMENSIONS

DMCLDC BRUSHED DC SERVO MOTOR DRIVER



BRUSHED DC

Tol-O-Matic System Compatibility

- Drives MRB series brushed DC servo motors to provide motor/drive system performance shown in the MRB motor section (see pages 57-62)
- Easily integrated to the SSC multi-axis/multi-function controller (see pages 21-26)
  When ordering with Controller all interconnecting cabling is automatically configured and included.
- Integral to single axis controller (MSCLDC, see pages 34-36)

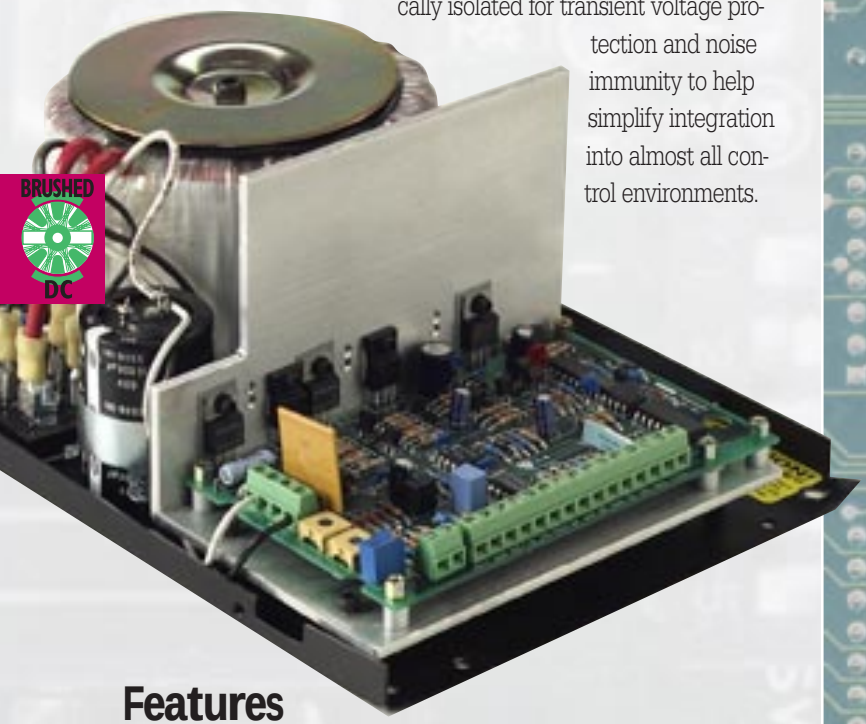
Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
DMCLDC	• Open Chassis Brushed DC Servo Motor Drive • User Manual	3600-0049

DM5 & DM6 OPEN LOOP BRUSHED DC DRIVE

FEATURES • SPECIFICATIONS • DIMENSIONS • ORDERING

DM open loop, brushed DC motor drive modules are available with two different power supply options. Available in open chassis configuration, DMs can be ordered as part of a complete, matched Axidyne Dc Control System (with controller, motor and actuator) or separately for use with customer-provided control systems. Four inputs (On/Off, Brake, Fwd/Rev, Enable) are available for use with a Tol-O-Matic or customer-supplied controller, a PLC, or with manual control from separately-mounted switches. Speed control can be provided by a potentiometer or dc analog voltage input. Inputs are optically isolated for transient voltage protection and noise immunity to help simplify integration into almost all control environments.



BRUSHED DC

Features

- ***Choice of two power rating configurations*** (matched to Axidyne dc motor ratings).
- ***Open-chassis configuration***
- ***Self resetting fuse for dc supply to drive***
- ***Jumper selectable speed control with potentiometer*** or 1.5 to 4.1 V.dc analog signal from PLC or controller modules
- ***Optional solid state dynamic braking circuitry*** for accuracy and consistency
- ***Lockout fault protection*** for dc power supply output under-voltage
- ***Adjustable current trip level*** for over current (overload condition) protection
- ***Fault condition*** (lock out) output for L.E.D.
- ***L.E.D. status indicators*** for enabled and fault (open-chassis configuration only)
- ***Independent acceleration and deceleration adjustment*** (0 to 7.0 seconds)
- ***Inhibit drive using Enable input*** for immediate dc drive shut down

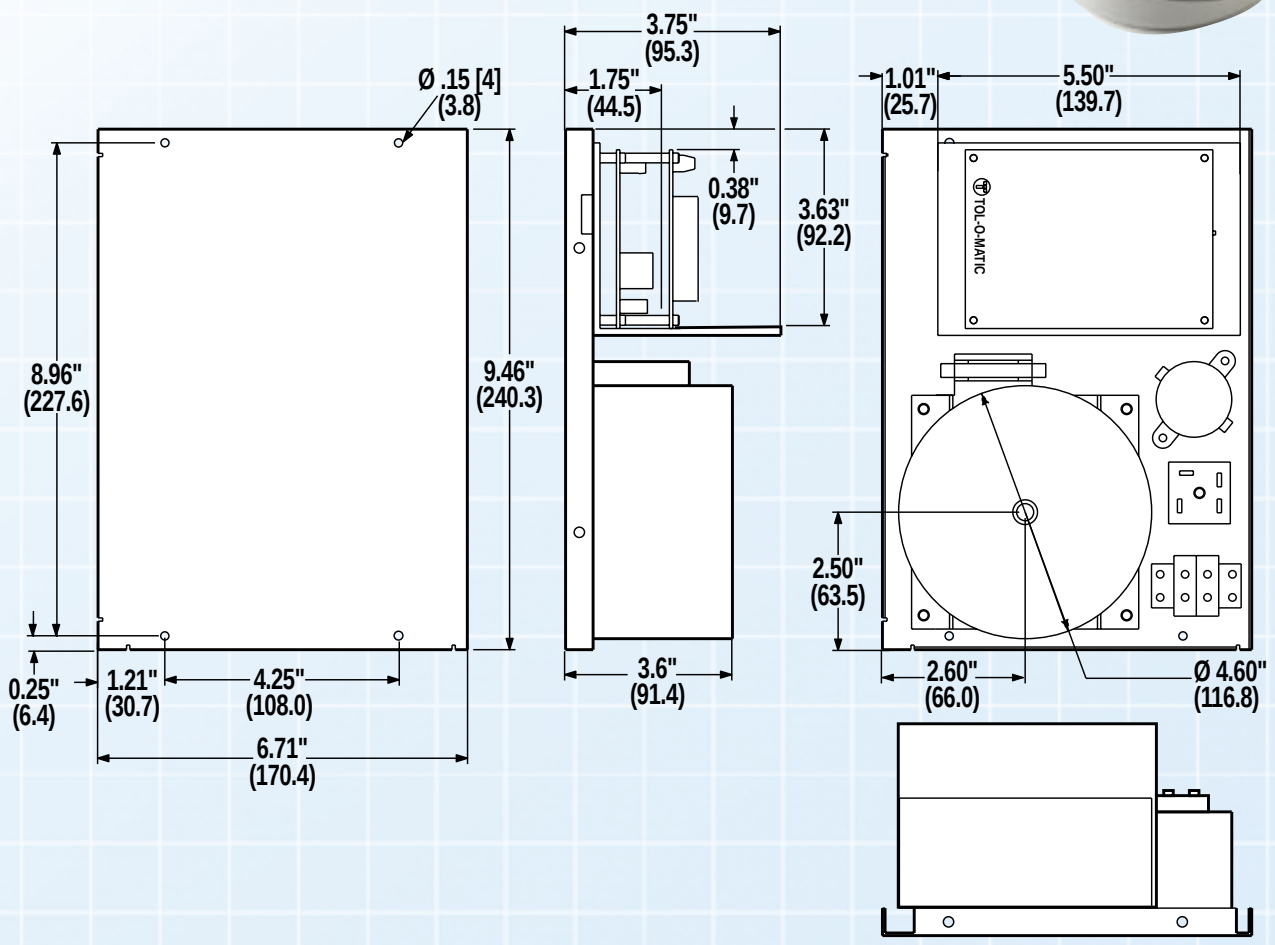
SPECIFICATIONS

SPECIFICATIONS	DM Open Loop Brushed DC Drive Module
Power	
Input Current (AC line):	115 Vac/60 Hz (85-128 Vac range)
DM5 Output Voltage:	32 Vdc
DM5 Continuous Current:	15 Amp
DM6 Output Voltage:	48 Vdc
DM6 Continuous Current:	10 Amp
DM5, DM6 Peak Current:	30 Amp (5 millisecond rating)
DM5, DM6 Max. Power:	480 Watts
P.W.M	
Frequency	20 kHz
% P.W.M. vs Potentiometer Voltage Reference	0% PWM @ 1.5 Vdc to 100% PWM @ 4.1 Vdc
Auxiliary Speed Control	
Potentiometer Range:	10K Ω range for externally provided potentiometer (included with drive)
Analog input:	1.5 to 4.1 Vdc
Accel./Deceleration Range:	0 to 7.0 seconds
Over-Current Trip Setting	
Potentiometer:	25 turn potentiometer adjustable to 125% of rating
Delay:	0.2 second delay / self adjusting for accel.
Environment	
Temperature Range:	32° to 122° F (0° to 50° C)
Humidity:	10 - 95% non-condensing
Reset:	Normally closed momentary reset input.
Fault Indicator	
L.E.D.:	on Drive
OUTPUT:	for external L.E.D.
Drive Module Optically-Isolated Inputs•	
On/Off:	Initiates acceleration or deceleration profile
Brake:	Stopping of motor with dynamic braking
Fwd/Rev:	Reversing motor direction
Enable:	Disabling or enabling power to the drive Fault Reset - Clears current trip fault

•Dc voltage supply (5 to 25 Vdc/25 mA. max.) required to power Drive Module opto-isolation when NOT used with Basic Controller Module.

DIMENSIONS

DM OPEN LOOP BRUSHED DC DRIVE MODULE



Tol-O-Matic System Compatibility

- Drives MRB series brushed DC servo motors to provide motor/drive system performance shown in the MRB motor section (see pages 51-62)

Ordering Information

Configuration Code	Includes	Tol-O-Matic Part #
DM5	• Open Chassis Open Loop Brushed DC Drive Module • User Manual	3600-0406
DM6	• Open Chassis Open Loop Brushed DC Drive Module • User Manual	3600-0407

MOTORS

Axidyne motors are available for brushless servo, microstepping and brushed dc systems. These motors combine flexibility and superior performance in compact packages

MRB Brushed DC Motors

Axidyne's MRB brushed dc motors are the choice for cost sensitive applications requiring smooth and quiet low speed operation.

MRV Brushless Servo Motors

Designed for maximum power density, these motors come with integral commutation Hall-effect devices and internally mounted 1000 line encoder.

MRS Stepper Motors

Axidyne's MRS stepper motors are the best cost/performance value available, with high torque to inertia ratios and exceptional thermal dissipation properties.

MRV BRUSHLESS SERVO MOTORS

FEATURES • SPECIFICATIONS • PERFORMANCE DATA • DIMENSIONS • ORDERING

Tol-O-Matic's MRV series brushless servo motors provide a wide range of rated torques and speeds for applications requiring long life under continuous, difficult environment operation. These motors are designed for maximum power density. The MRV series motor come with integral commutation Hall-effect devices and an internally mounted 1000 line encoder.

Features

- ***Rugged industrial enclosures***
- ***Large shafts and bearings*** for longer life with high radial axial loads
- ***Dual convenient MS connectors*** to simplify motor termination and provide excellent noise immunity
- ***Common industrial mechanical flanges*** (NEMA 23, 34)
- ***Integral Hall-effect devices for commutation***
- ***Integral 1000 line TTL encoder*** with differential line driver outputs
- ***Ideally suited for use with SSD drives*** (motor parameters are stored with drive)

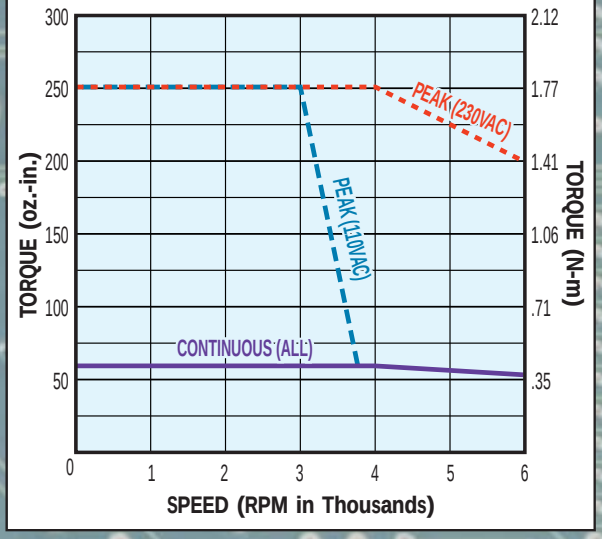
SPECIFICATIONS

	T CONT		T PEAK		KE	KT		RT	I CONT	I PEAK	RTH	L	J_R		WEIGHT	
	OZ•IN	N•M	OZ•IN	N•M	VOLTS/1000 RPM	OZ•IN/AMP	N•M/AMP	OHMS ±10%	AMPS	AMPS	°C/WATT	±15% MH	OZ•IN²	GM•CM²	LBS.	KGS.
MRV231	60	0.42	180	1.27	24.50	33.1	0.23	9.16	2.1	8	1.80	7.6	0.77	140.8	2.2	1.0
MRV232	120	0.85	360	2.54	19.59	26.4	0.19	2.04	5.2	21	1.30	2.1	1.55	283.5	3.1	1.4
MRV233	160	1.13	550	3.88	29.40	39.7	0.28	2.73	4.6	18	1.23	2.9	2.32	424.3	4.0	1.8
MRV234	198	1.40	752	5.31	39.19	52.9	0.37	3.36	4.3	17	1.16	3.8	3.09	565.2	5.0	2.3
MRV341	271	1.91	1157	8.17	31.00	41.9	0.30	2.50	6.9	28	0.72	6.1	6.18	1130.3	8.0	3.6
MRV342	512	3.62	2168	15.31	47.00	63.5	0.45	2.00	8.6	34	0.58	6.1	11.21	2050.3	11.5	5.2
MRV343	748	5.28	3168	22.37	56.00	75.6	0.53	1.40	10.5	42	0.56	5.1	16.23	2968.5	15.0	6.8

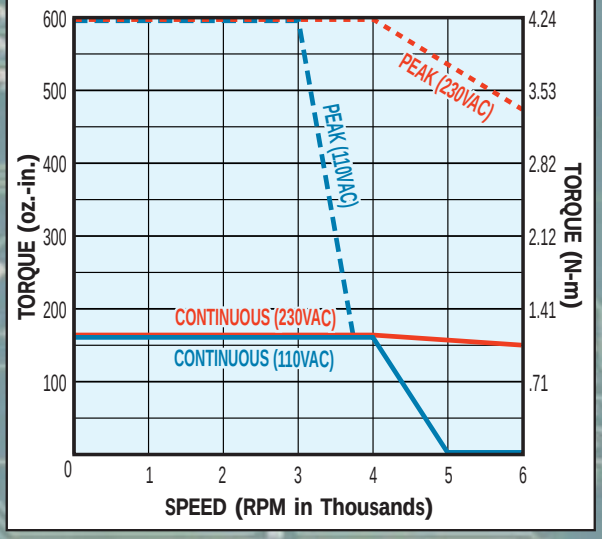
All ratings typical and at 77°F (25°C) unless otherwise noted. Winding temperature at 257°F (125°C).

PERFORMANCE DATA

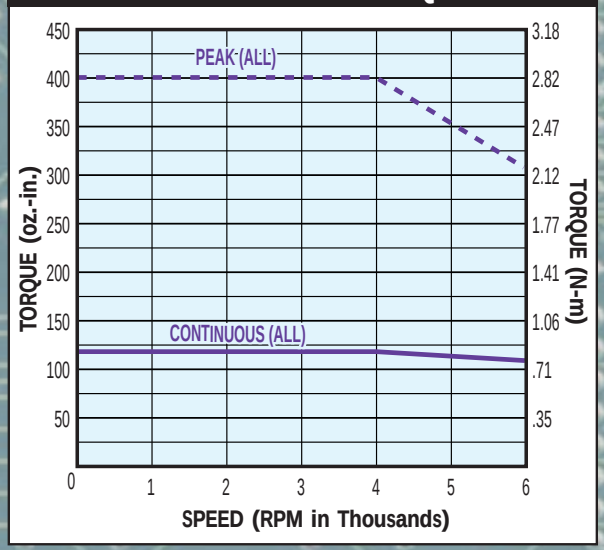
MRV231/SSD5 SPEED TORQUE CURVE



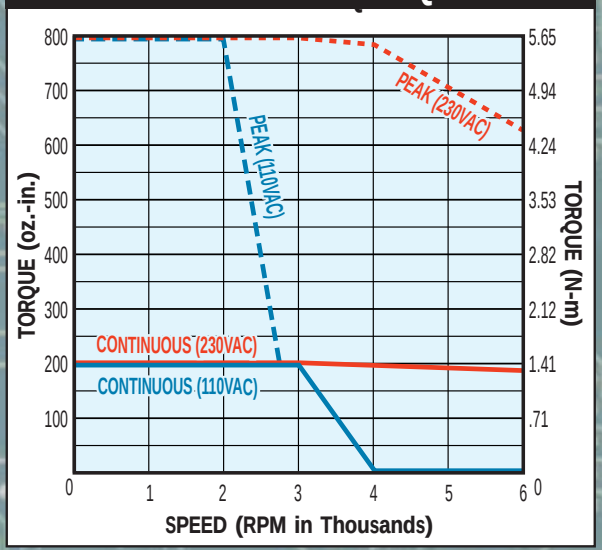
MRV233/SSD10 SPEED TORQUE CURVE



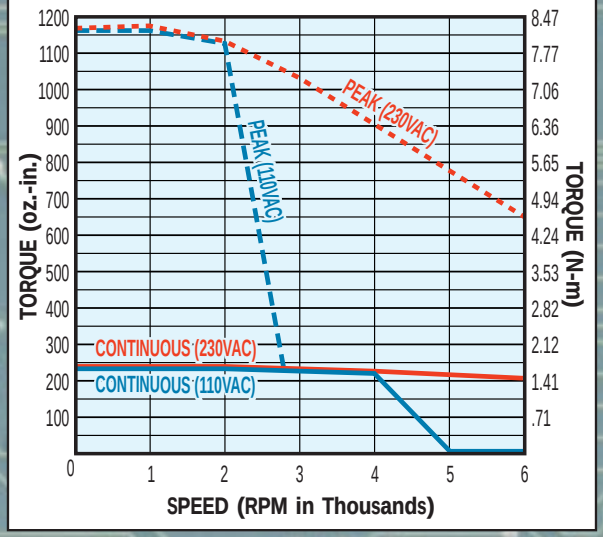
MRV232/SSD10 SPEED TORQUE CURVE



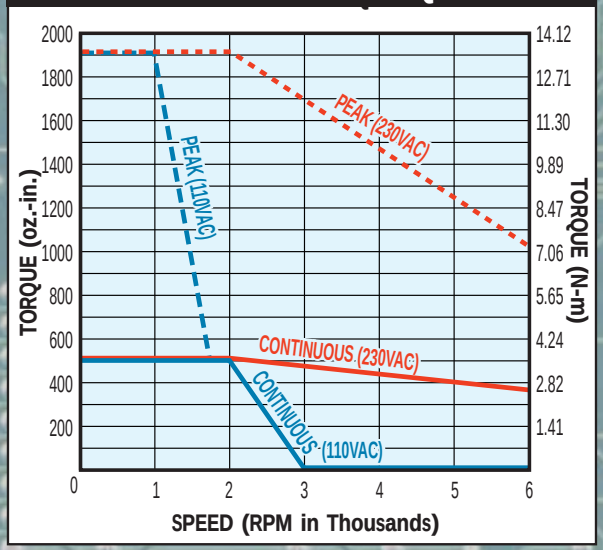
MRV234/SSD10 SPEED TORQUE CURVE



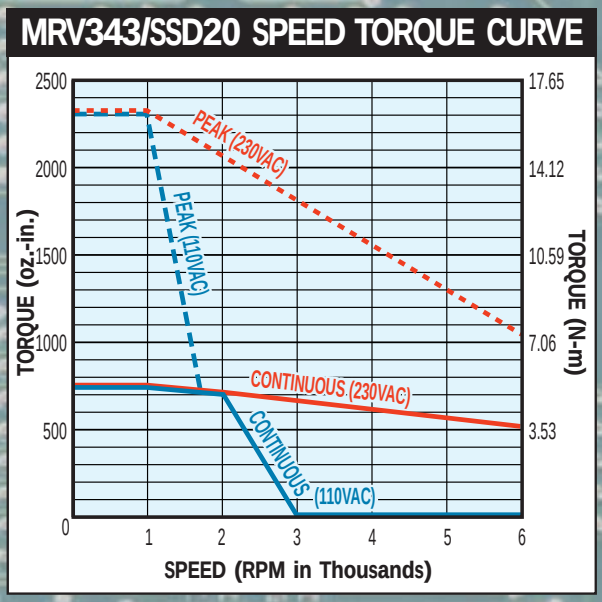
MRV341/SSD20 SPEED TORQUE CURVE



MRV342/SSD20 SPEED TORQUE CURVE

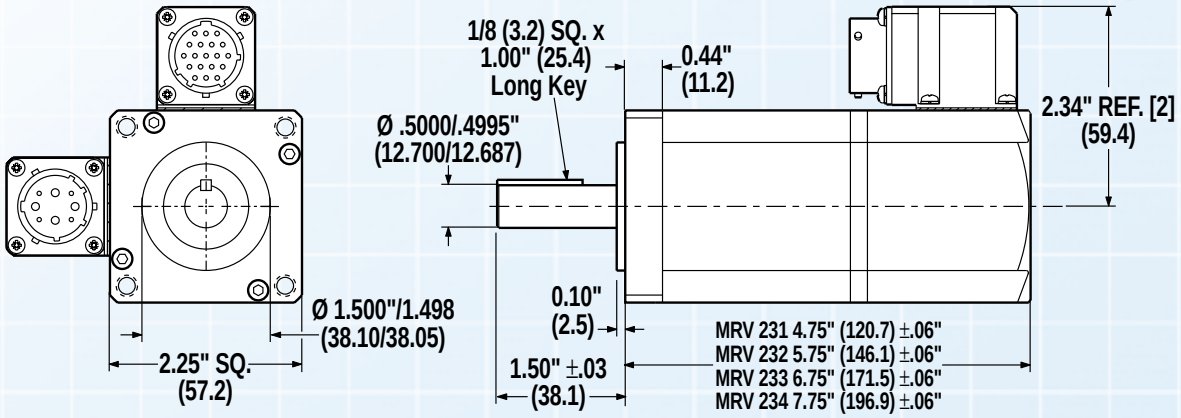


MRV343/SSD20 SPEED TORQUE CURVE

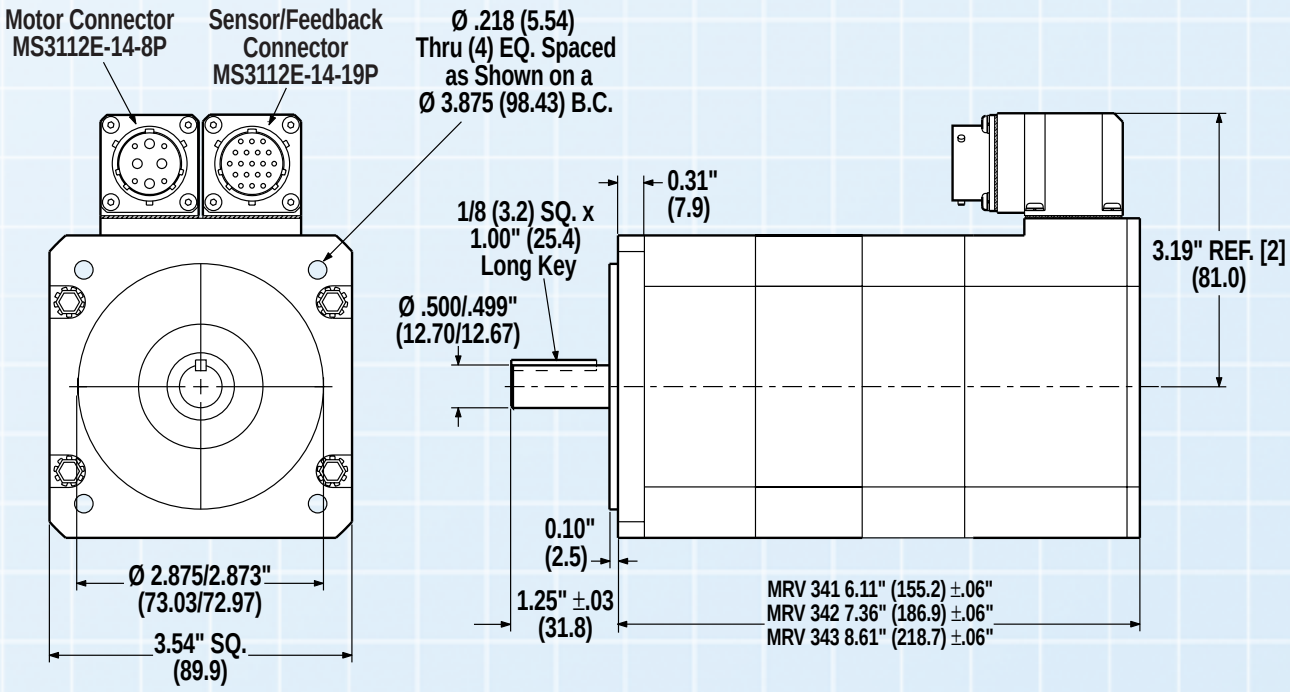


DIMENSIONS

MRV231, 232, 233, 234



MRV341, 342, 343



Cables

Motor cable and encoder cable are included when ordering SSD drives. (see page 141)

Ordering

Configuration Code	Tol-O-Matic Part #
MRV231	3600-6120
MRV232	3600-6122
MRV233	3600-6123
MRV234	3600-6124

Configuration Code	Tol-O-Matic Part #
MRV341	3600-6125
MRV342	3600-6126
MRV343	3600-6127

MOUNTING INFO

SCREW-DRIVES
Couplers/Motor Mounting Kits Page 99
In-line Gearhead Mounting Page 103
In-line Gearhead Mount Dim. Page 109
In-line Motor Mounting Dim Page 112
Reverse-Parallel Mounting Page 114

BELT-DRIVES
Direct Drive Mounting Page 119
Reduction Drive Mounting Page 121

MRS STEPPER MOTORS

FEATURES • PERFORMANCE DATA • SPECIFICATIONS • DIMENSIONS • ORDERING

The MRS series motors provide the best cost/performance value available in stepper motors. Available with NEMA 23 and 34 mounting, the MRS series stepper motors can be driven from one common microstepping drive (MSD or controller/drive (MSS)

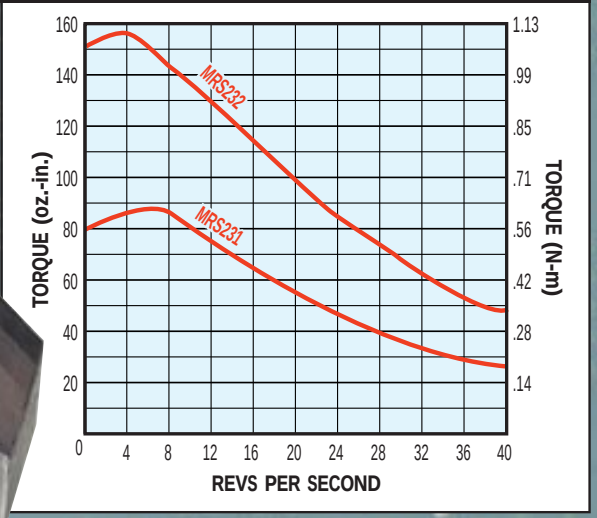
Features

- *Long life bearings*
- *High temperature insulation*
- *Exceptional thermal dissipation properties*
- *NEMA 23 and 34 mounting*
- *High torque to inertia ratio*

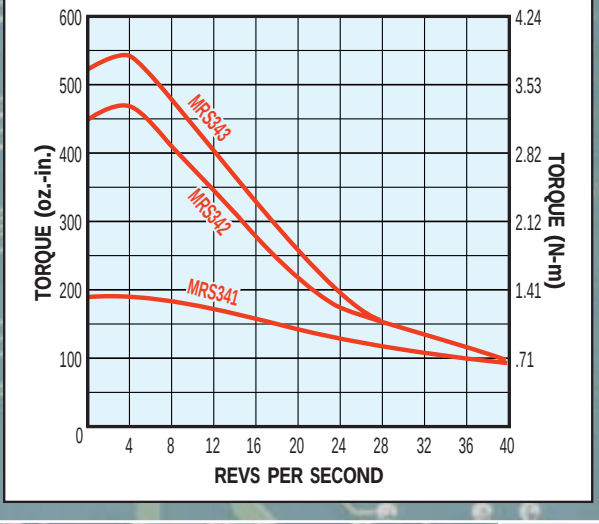
PERFORMANCE DATA

WITH MSS CONTROLLER/DRIVE OR MSD DRIVE

MRS231/232 SPEED TORQUE CURVE



MRS341/342/343 SPEED TORQUE CURVE



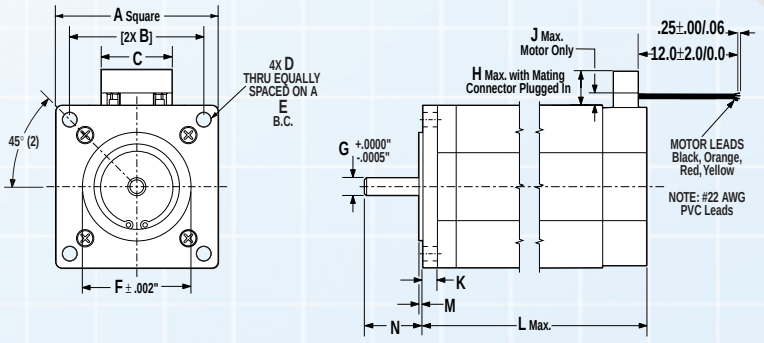
SPECIFICATIONS

	HOLDING TORQUE* 2 PHASES ON		RATED CURRENT/PHASE**	PHASE RESISTANCE	PHASE INDUCTANCE†	THERMAL RESISTANCE††	ROTOR INERTIA		WEIGHT	
	OZ-IN (±10%)	N•M	AMPS, RMS	OHMS ±10%	MH	°C/WATT	OZ-IN²	GM•CM²	LBS	KGS.
MRS231	109	0.77	1.51	2.61	10.3	5.5	0.66	120.7	1.5	0.68
MRS232	203	1.43	2.50	1.22	6.2	4.5	1.39	254.2	2.5	1.13
MRS341	236	1.67	5.40	0.29	2.3	3.9	3.21	587.1	3.2	1.45
MRS342	627	4.43	5.60	0.39	3.7	2.7	6.57	1201.7	5.3	2.40
MRS343	995	7.03	7.90	0.26	3.1	2.0	9.66	1766.8	7.6	3.45

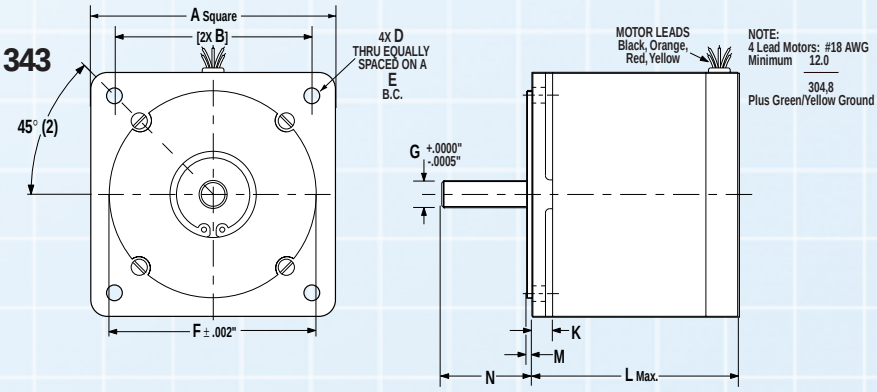
* With rated current applied. Windings at 130°C and motor unmounted and in still air at 40°C (without heat sink).
** Windings at 130°C and motor in still air at 40°C (without heat sink). Operation of these motors above rated current may cause demagnetization. Contact factory.
† Small signal inductance as measured with impedance bridge at 1kHz, 1 amp.
†† Thermal resistance measured with motor hanging in still air (unmounted).

DIMENSIONS

MRS231, 232



MRS341, 342, 343



MRS Motors Dimensions													
	A	B	C	D	E	F	G	H	J	K	L	M	N
MRS 231	2.25	1.85	0.99	Ø .200	Ø 2.625	1.500	Ø 0.2500	0.48	0.18	0.20	2.06	0.055	0.81
MRS 232	2.25	1.85	0.99	Ø .200	Ø 2.625	1.500	Ø 0.2500	0.48	0.18	0.20	2.06	0.055	0.81
MRS 341	3.38	2.735	NA	Ø .218	Ø 3.875	2.875	Ø 0.3750	NA	NA	0.18	2.58	0.060	1.25
MRS 342	3.38	2.735	NA	Ø .218	Ø 3.875	2.875	Ø 0.3750	NA	NA	0.18	3.76	0.060	1.25
MRS 343	3.38	2.735	NA	Ø .218	Ø 3.875	2.875	Ø 0.3750	NA	NA	0.18	3.76	0.060	1.25

Above Dimensions in Inches

MRS Motors Dimensions													
	A	B	C	D	E	F	G	H	J	K	L	M	N
MRS 231	57.2	47.0	25.1	Ø 5.08	Ø 66.68	38.10	Ø 6.35	12.2	4.6	5.1	52.3	1.4	20.6
MRS 232	57.2	47.0	25.1	Ø 5.08	Ø 66.68	38.10	Ø 6.35	12.2	4.6	5.1	52.3	1.4	20.6
MRS 341	85.9	69.4	NA	Ø 5.54	Ø 98.43	73.03	Ø 9.53	NA	NA	4.6	65.5	1.5	31.8
MRS 342	85.9	69.4	NA	Ø 5.54	Ø 98.43	73.03	Ø 9.53	NA	NA	4.6	95.5	1.5	31.8
MRS 343	85.9	69.4	NA	Ø 5.54	Ø 98.43	73.03	Ø 9.53	NA	NA	4.6	95.5	1.5	31.8

Above Dimensions in Millimeters

Ordering

Configuration Code	MRS231	MRS232	MRS341	MRS342	MRS343
Tol-O-Matic Part #	3600-6130	3600-6131	3600-6132	3600-6133	3600-6134

MOUNTING INFO

SCREW-DRIVES
Couplers/Motor Mounting Kits Page 99
In-line Gearhead Mounting Page 103
In-line Gearhead Mount Dim. Page 109
In-line Motor Mounting Dim Page 112
Reverse-Parallel Mounting Page 114

BELT-DRIVES
Direct Drive Mounting Page 119
Reduction Drive Mounting Page 121

MRB & MRBN BRUSHED DC MOTORS

FEATURES • SPECIFICATIONS • PERFORMANCE DATA • DIMENSIONS • ORDERING

For cost sensitive applications requiring smooth and quiet low speed operation, Tol-O-Matic provides the MRB series brushed DC motors. Available with a wide range of torque/speed characteristics, the MRB motors are ideal for operation in an open loop system (DM5/6 or DM5C/6C drive module) or in a servo system (DMCLDC or MSCLDC).

Features

- *Rugged industrial enclosures*
- *Available with 500 line TTL encoder for servo operation*
- *Ideal for operation with DM5/6 open loop drives or DMCLDC/MSCLDC brushed servo drives*

BRUSHED DC

SPECIFICATIONS

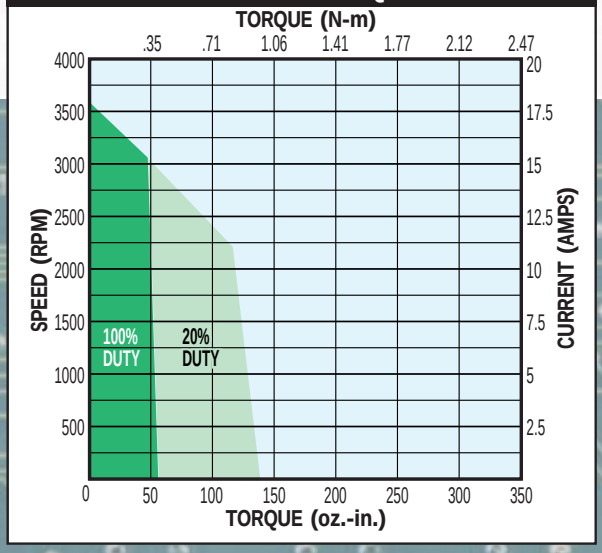
	KE	KT		RA	ROTOR INERTIA		THERMAL RES	WEIGHT	
	VOLTS/1000 RPM	OZ•IN/AMP	N•M/AMP	OHMS	OZ•IN²	GM•CM²	°C/W	LBS	KGS
MRB231	12.70	17.10	0.12	1.70	1.92	351	0.40	3.5	1.6
MRB341	15.12	19.75	0.14	0.97	15.36	2809	2.80	6.0	2.7
MRB342	15.83	20.35	0.14	0.51	20.48	3746	2.10	8.4	3.8
MRB401	20.10	27.20	0.19	0.60	100.67	18413	1.09	17.0	7.7
MRB402	38.00	51.36	0.36	0.60	122.28	22365	0.90	20.0	9.1

Closed Loop

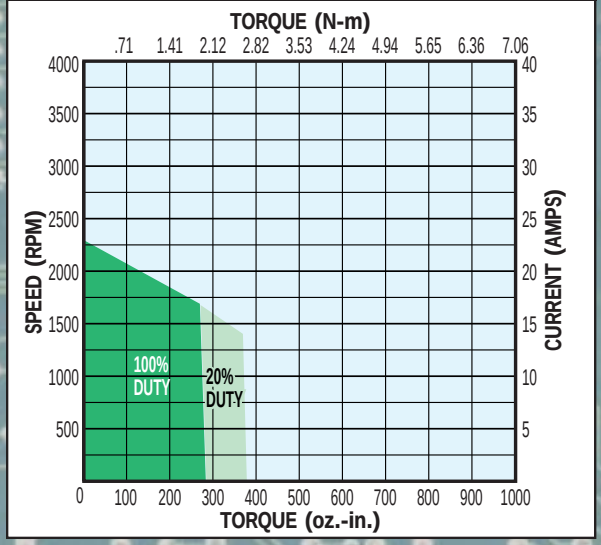
PERFORMANCE DATA

WITH MSCLDC CONTROLLER/DRIVE OR DMCLDC DRIVE

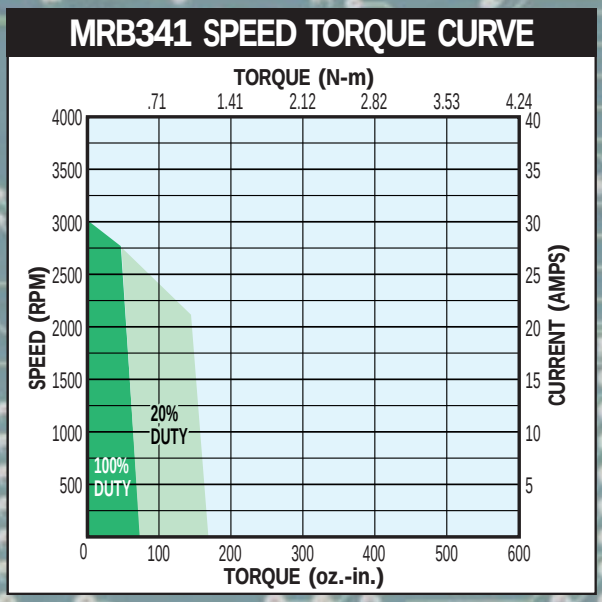
MRB231 SPEED TORQUE CURVE



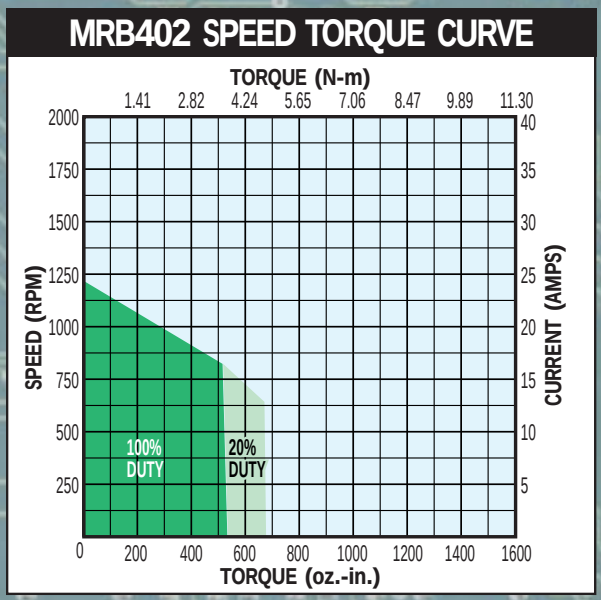
MRB401 SPEED TORQUE CURVE



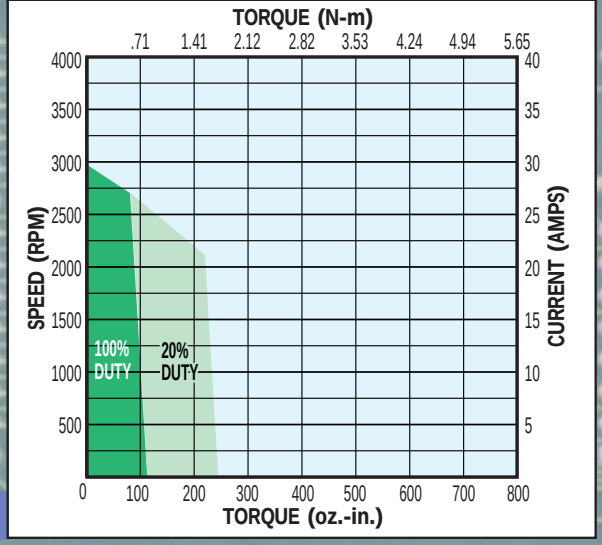
MRB341 SPEED TORQUE CURVE



MRB402 SPEED TORQUE CURVE



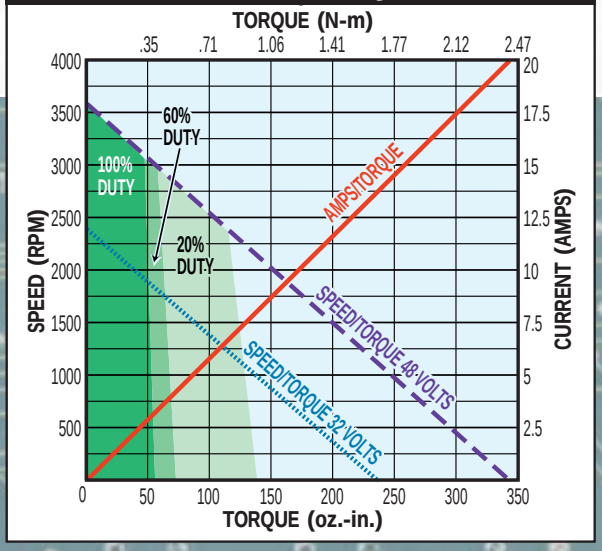
MRB342 SPEED TORQUE CURVE



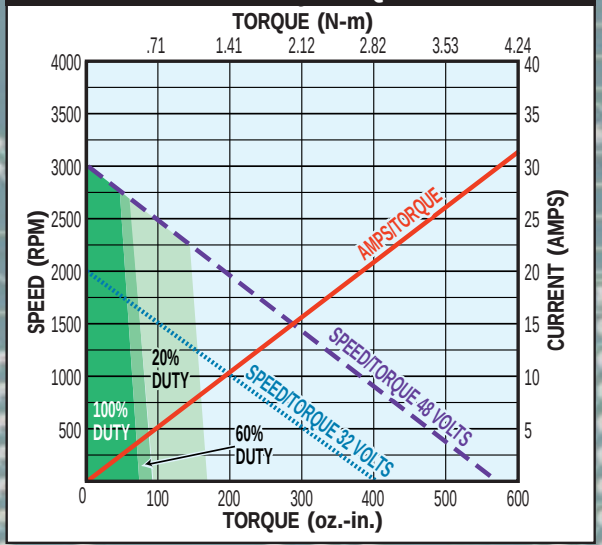
Open Loop

PERFORMANCE DATA

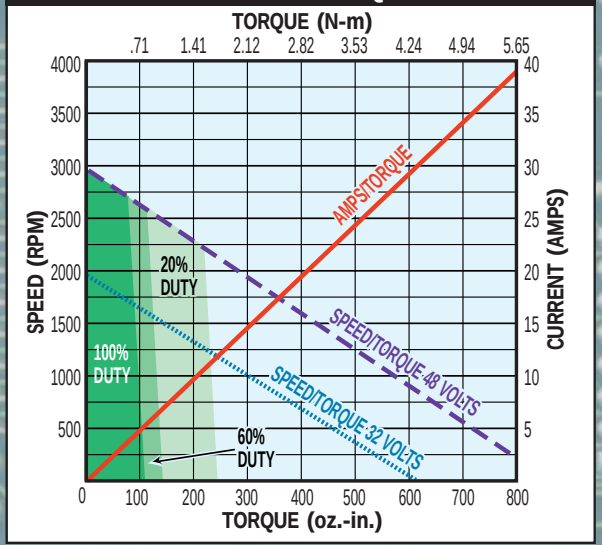
MRB231 SPEED TORQUE CURVE



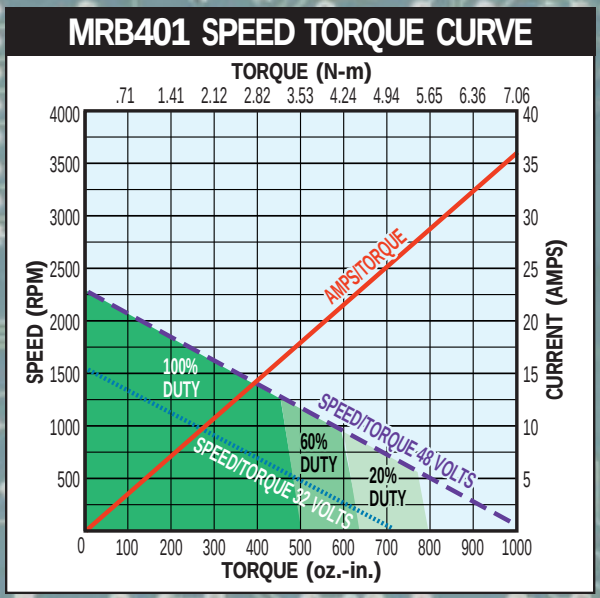
MRB341 SPEED TORQUE CURVE



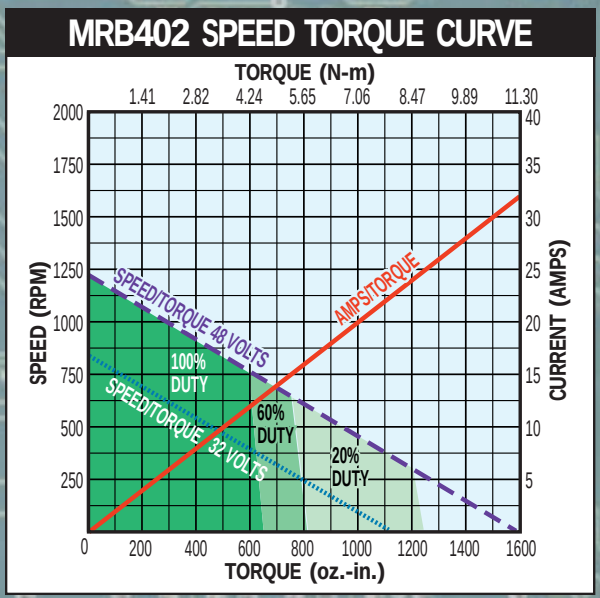
MRB342 SPEED TORQUE CURVE



MRB401 SPEED TORQUE CURVE

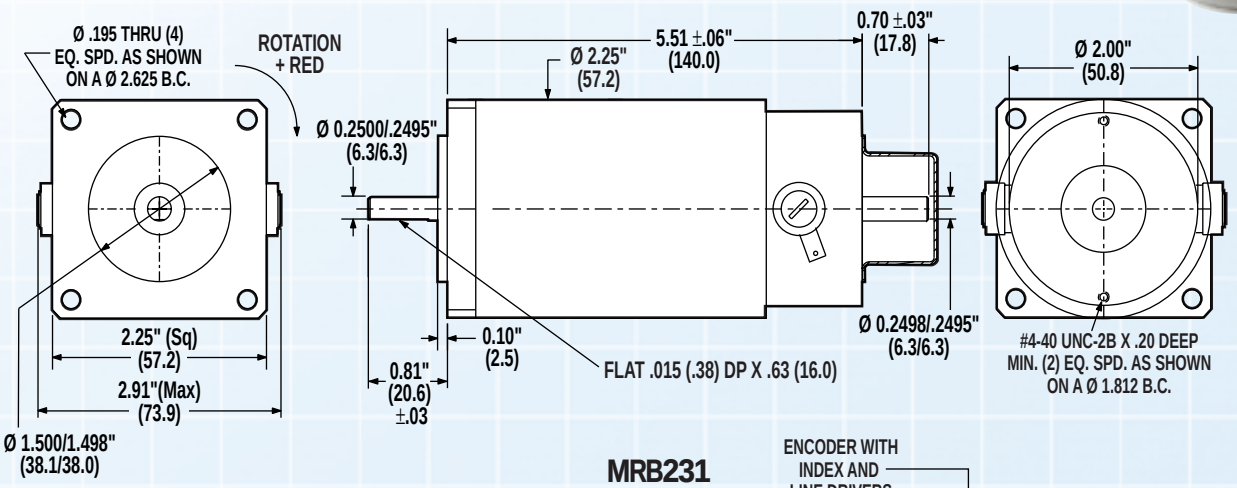


MRB402 SPEED TORQUE CURVE

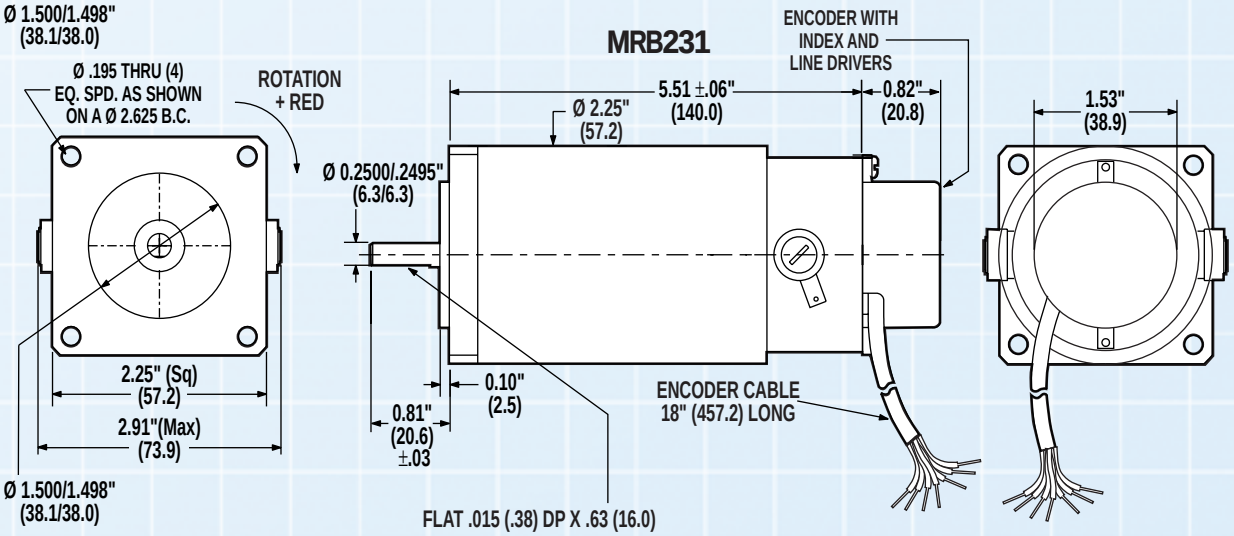


DIMENSIONS

MRB231N



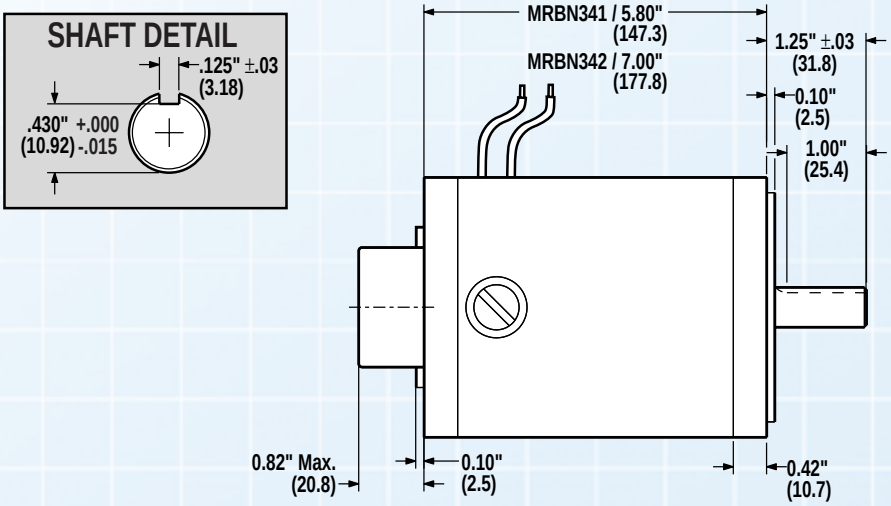
MRB231



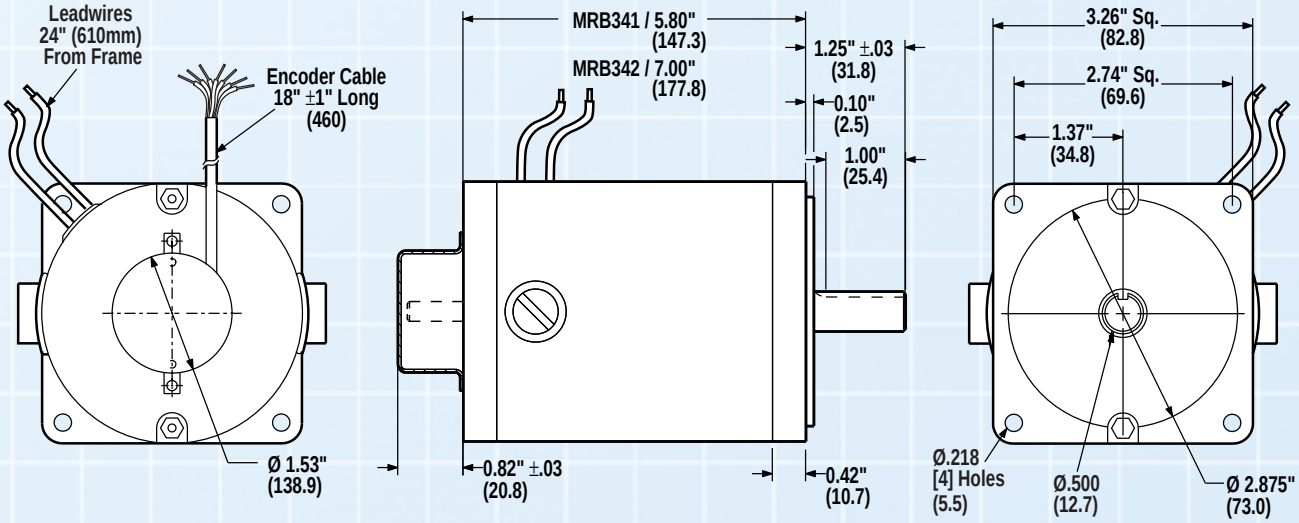
BRUSHED DC

DIMENSIONS

MRB 341N/342N MOTOR



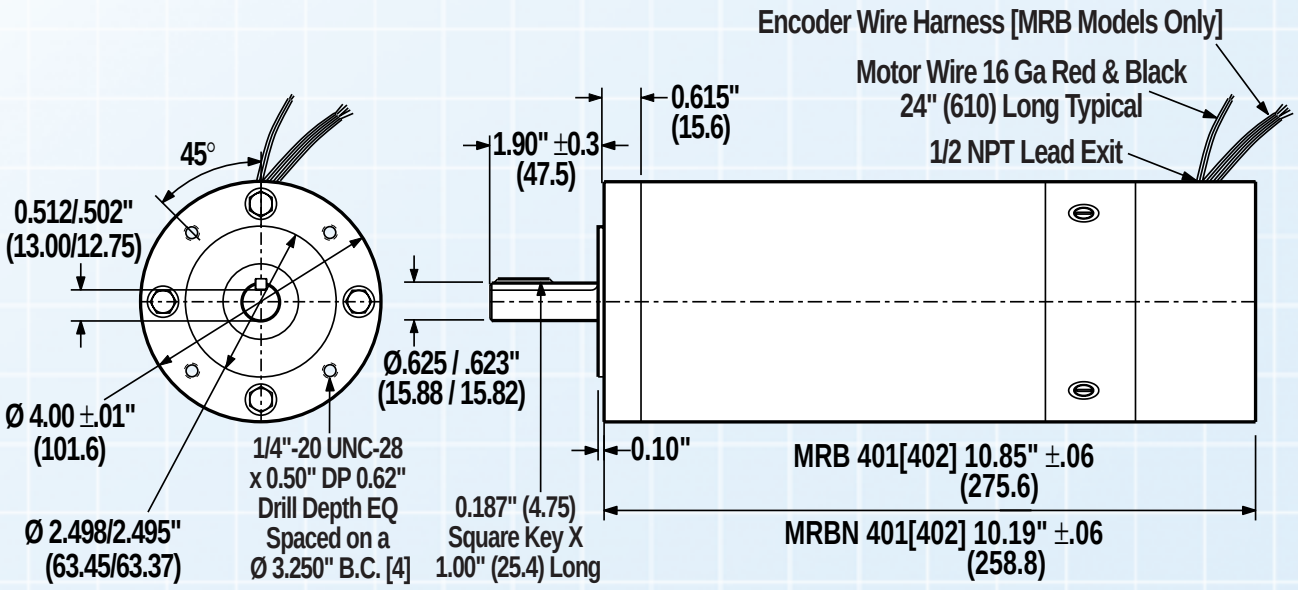
MRB 341/342 MOTOR



BRUSHED DC

DIMENSIONS

MRB401/402 AND MRBN401/402



BRUSHED DC

Cables

All MRB series motors include a 24-inch flying lead motor power cable.

Encoder cables are 18 inch flying lead with the following pinout:

Ordering Info

Configuration Code	Tol-O-Matic Part #
MRB231	3600-6145
MRB341	3600-6146
MRB342	3600-6147
MRB401	3600-6148
MRB402	3600-6149
MRB231N	3600-6140
MRB341N	3600-6141
MRB342N	3600-6142
MRB401N	3600-6143
MRB402N	3600-6144

Wire Colors

PIN	CA FUNCTION	WIRE COLOR
1	+VCC	Red
2	GND	Black
3	CH A	White
4	CH A Not	Yellow
5	CH B	Green
6	CH B Not	Blue
7	Index	Orange
8	Index Not	Brown
	Shield	Drain

MOUNTING INFO

SCREW-DRIVES
Couplers/Motor Mounting Kits Page 99
In-line Gearhead Mounting Page 103
In-line Gearhead Mount Dim. Page 109
In-line Motor Mounting Dim Page 112
Reverse-Parallel Mounting Page 114

BELT-DRIVES
Direct Drive Mounting Page 119
Reduction Drive Mounting Page 121

Axidyne®
MECHANICAL
ACTUATORS
TOL-O-MATIC

Axidyne®

MECHANICAL ACTUATORS

Screw actuators in three load carrying designs for accurate positioning of heavy, offset loads. Belt actuators in two load carrying designs for higher speeds and longer strokes.

PATENTED SEALED RECIRCULATING BEARINGS FOR LONG LIFE

B3S/M3S Screw- and B3B/M3B Belt-Drives

For *high load and moment load capacity* with consistent tracking, this series of actuators features a patented* *heavy duty recirculating bearing system in gothic arch rail guides*. This system offers *wear resistance with repeated accuracy*. Bearings are sealed for long wear and extended performance.

The B3S and B3B Series provide the highest load (over 2000 lbs) and moment load capacity of all Axidyne actuators with consistent tracking for full actuator life.

B3S Screw-Drive

- 3 body sizes
- Same envelope size as BCS actuators with higher load capacities
- 20 standard (inch) models
  Three body sizes and 20 different screw/nut combinations.
- 12 metric models
  Three body sizes and 12 screw/nut combinations.
- Custom order strokes in any incremental length

B3B Belt-Drive

- 3 body sizes
- Neoprene belt material for higher speeds.
- 3:1 Reduction drive
  Available for matching motor speed and inertia.
- Custom-order stroke lengths
  Custom strokes up to18 feet in any incremental length. *(For longer strokes, consult the factory.)*

* U.S. Patent No. 5,555,789

SLS/MLS Screw-Drives

These pre-engineered, *load-supporting and fully enclosed* slide-style actuators use a *guidance system of recirculating bearings on ground steel shafts* providing consistent carrier tracking and long actuator life. Using the *same patented band retention system* as the BCS style actuators, SLS actuators are available in one body size and offer a *rigid, low-profile design*, ideal for space-sensitive applications.

- **Extruded work table**
  Fully extruded anodized-aluminum work table has two parallel "T" slots for mounting flexibility and stability.
- **Single-piece housing**
  Fully extruded anodized aluminum housing increases stability and provides continuous bearing rod support along full stroke.
- **6 standard (inch) models**
  One body size and two different screw sizes with anti-backlash option.
- **4 metric models**
  One body size and two screw sizes in ACME or Ball selections.
- **Custom-order strokes in any incremental length**

BCS/MCS Screw- and BCB Belt-Drives

This group of actuators utilizes a guidance system consisting of a *patented* adjustable carrier bracket* designed to transmit the load to the cylinder body instead of the screw or belt for true tracking, superior load support and controlled minimum friction load. The load-bearing carrier system uses *two self-lubricating Delrin bearing rods* to pass force directly to the cylinder tube.. A *patented** band retention system* uses a T-shaped elastomer strip bonded to a stainless steel band inserted directly into the body housing forming a tight metal-to-metal seal.

BCS Screw-Drive

- **20 standard (inch) models**
  Three body sizes combined with 20 different screw/nut combinations.
- **12 metric models**
  Three body sizes and 9 different screw sizes also with anti-backlash option.
- **Custom-order strokes in any incremental length**

BCB Belt-Drive

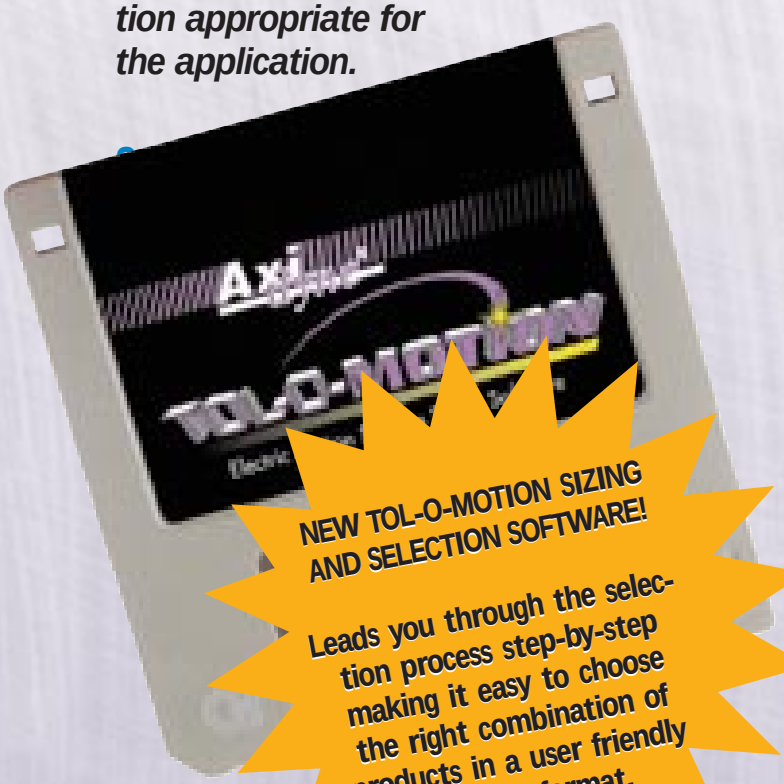
- **Higher speeds and longer strokes.**
- **Two-chamber tube extrusion**
- **Two choices of belt material**
  Polyurethane for lighter loads or neoprene for higher speeds.
- **3:1 Reduction drive**
  Available for increased thrust or for matching motor inertia.
- **Custom-order stroke lengths**
  Custom strokes up to 20 feet in any incremental length.

* U.S. Patent No. 4724744
** U.S. Patent No. 4545290

BASIC SELECTION

The procedure for selecting an Axidyne mechanical actuator depends on the complexity of your application. A simple but thorough evaluation of the application's motion requirements is required including the load support system, force requirements and limiting factors. Use the following selection procedure to help determine the appropriate actuator configuration appropriate for the application.

SELECTION KEY REQUIREMENTS	
STROKE LENGTH (in) [mm]	
LOAD WEIGHT (lb) [kg]	
LOAD SPEED (in/sec) [mm/sec]	
THRUST FORCE (lb) [kg]	
RESOLUTION/ REPEATABILITY (in) [mm]	
ACTUATOR ORIENTATION	
MOMENT LOADS (in-lb) [N-m]	
DUTY CYCLE	



NEW TOL-O-MOTION SIZING AND SELECTION SOFTWARE!

Leads you through the selection process step-by-step making it easy to choose the right combination of products in a user friendly Windows format.

Procedure

1. List Key Requirements

Begin the selection process by identifying actuator key requirements shown in the chart at left.

2. Determine whether a screw-style or belt-style actuator is appropriate for your application.

The maximum operating speed of screw actuators is limited by the critical speed characteristic of the screw. Belt-drive actuators are used in applications where speed(consult factory for applications over 100 inches/sec) and stroke length requirements exceed screw critical speed limitations. Screw actuators provide finer resolution and better repeatability than belt-drive units and are preferred for short stroke, high move repetition requirements. (See "Limiting Factors" in the "Comprehensive Product Selection" section of this catalog.)

NOTE: Belt-drive actuators are NOT recommended for vertical applications. Please consult the factory for further information.

3. Evaluate Load Support System.

The Tol-O-Matic Axidyne product family provides a selection of three load carrier support and guidance systems.

A. Adjustable carrier bracket with self-lubricating plastic bearing rods for BCS and BCB series cylinder-style actuators
The BCS series actuators provide good general purpose load capacity and tracking accuracy. Periodic carrier adjustment and bearing rod maintenance may be required.

B. Recirculating bearings on ground steel shafts for SLS10 Series slide-style actuators. These actuators provide consistent carrier tracking for full actuator life.

C. Heavy duty enclosed recirculating bearings in gothic arch guide rail for B3S and B3B series actuators.
This series provides the highest load and moment load capacity with consistent tracking and low carrier friction for the full actuator life.

Review the application requirements and select the appropriate actuator style. Then choose either metric or standard (inch) versions.

4. If screw-style is selected:

A. Select body style.

First evaluate the application's load and support requirements (consult performance and moment load charts for each body style – see performance data on pages 74, 76 and 78. Next, determine whether a standard or metric model is appropriate then choose one of the following:

Cylinder– BCS: Cost and size effective for most moment load and linear accuracy requirements. B3S: Heavier load capacity with higher accuracy.

Slide – Load-supporting housing and bearings provide lower friction, high load and moment-load capacity, improved torsional stability, and greater linear-path accuracy over the life of the actuator.

B. Select Screw Form and Nut Configuration.

1. Select Screw Form. Evaluate the application for accuracy, backlash, smoothness requirements, and life, then select the appropriate screw form:

Standard Rolled ACME Screw - Used with engineered solid plastic nuts, this non-hardened screw has a pitch accuracy rating of .005 in/ft. This combination is a cost-effective solution for most requirements. An ACME thread with a solid nut may reduce back driving in vertical applications.

Precision Rolled Ball Screw - Used with ball nuts, this hardened screw has a pitch accuracy rating of .003 in/ft. This combination provides higher thrust capacity and longer life in continuous-duty applications.

2. *Select Nut Configuration.* Once the screw form is selected, refer to Figure 1 then select the appropriate nut style depending on backlash concerns.

NUT	SOLID		BALL	
	Single	Anti-Backlash	Single	Low-Backlash
Backlash (in)	.007	.003	.015	.002
Backlash (mm)	.018	—	0.25	0.05
Designation	SN	SNA	BN	BNL

Figure 1

B. Select Screw Pitch/Lead and Body Size.

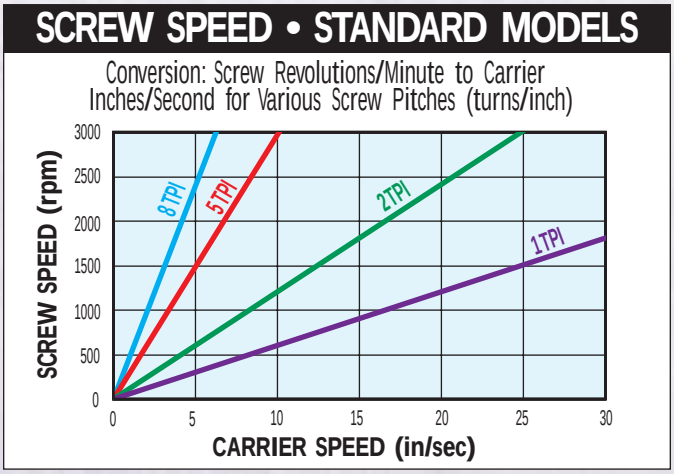
Evaluate the application's thrust, speed and stroke requirements in relation to the screw capability curves. Refer to the Performance Data charts of "Speed and Thrust vs Stroke" for the screws available in each model size. The screw speed charts (figure 2) and the chart of available models on pages 70 and 72 will help find a starting point for this evaluation.

If the screw size first selected is not adequate, move to the next appropriate body and screw size and reevaluate. Repeat this process until the correct screw pitch and body size are identified.

Pitch/Lead - Lower pitch (higher lead) provides higher linear speed, yet requires more drive torque.

AND

Body Size - Larger bodies provide more load support capability and accommodate larger diameter screws. Larger screw diameters permit higher rotational speeds, more thrust capability, and allow the use of longer screw lengths.



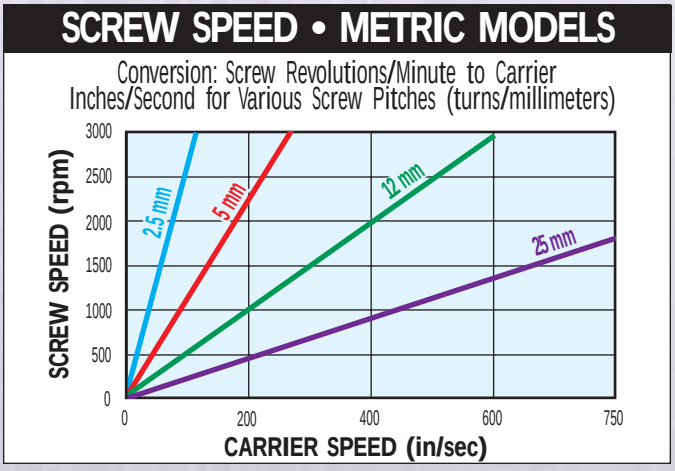


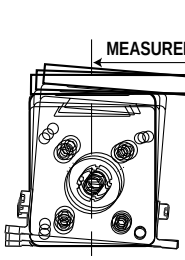
Figure 2

BASIC SELECTION

C. **Confirm Selection.**
Refer to the reference section in this catalog for detailed calculations of thrust and torque requirement to confirm actuator selection and to help select motor/drive.

D. **B3S Deflection Considerations.**
In applications where substantial Ms moments come into play, deflection of the cylinder tube, carrier and supports must be considered. The deflection factors shown in the chart below are based on a cylinder mounted with tube supports at minimum recommended spacing. (Refer to Figure 3.) If more rigidity is desired, refer to Dual Carrier option on pages 90-92.

B3S/B3B CYLINDER LOAD DEFLECTION



Figures calculated with the following considerations:
1) Tube supports spaced at minimum distances for each bore size
2) Measurement distance from F to center of carrier is 13 inches

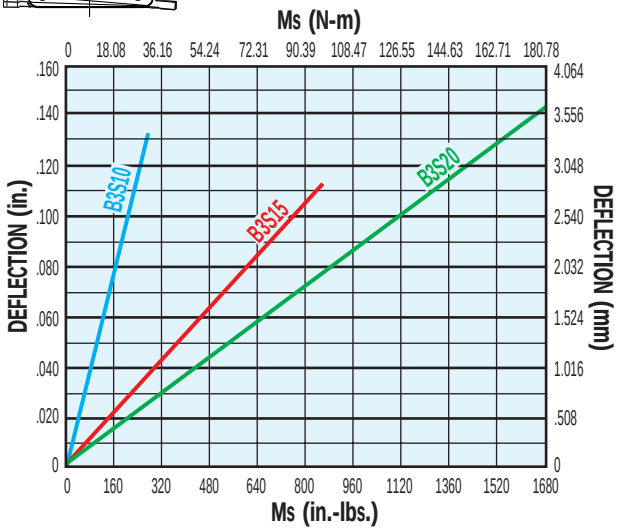


Figure 3

BCB BELT SPEED

Conversion: Motor Revolutions/Minute to Carrier Inches/Second for 1:1 and 3:1 Drive Ratios

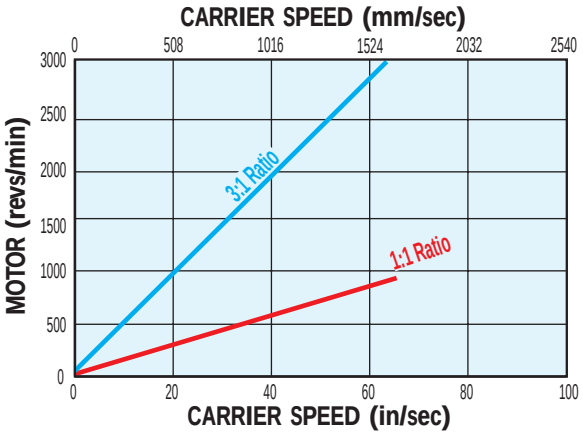
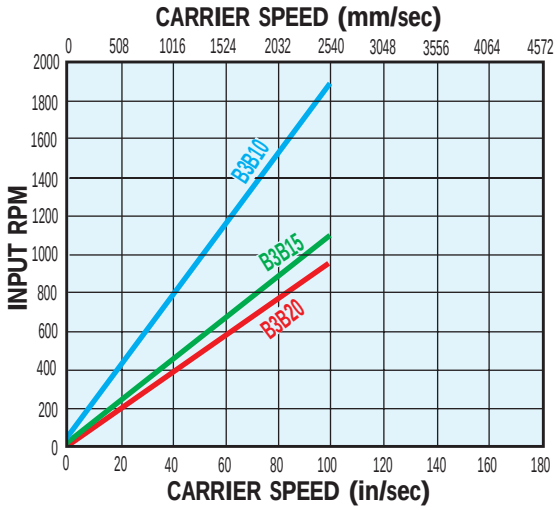


Figure 4

B3B BELT SPEED

Conversion: Motor Revolutions/Minute to Carrier Inches/Second for 1:1 Drive Ratio



For speeds over 100 in/sec, consult the factory.

Figure 5

5. If belt-style is selected:

A. **Evaluate the application's load and support requirements**
Consult the performance data and moment load charts for Axidyne belt-drive actuators on page 82-84. Refer to the belt speed charts in Figure 4 and 5 at right to select either BCS or B3S body styles.

B. **B3B Deflection Considerations**
Refer to "D." B3S Deflection Considerations and Figure 3 above.

6. Select options and accessories

Refer to the options and accessories section of this catalog for the available options for the actuator selected.

7. Configure the order

When the product selection process is complete, proceed to the Ordering Information pages 133-136.

SCREW-DRIVE ACTUATORS

Axidyne screw-drive actuators are available in three body styles each employing a different load-carrying bearing system for the widest number of solutions to your application requirements

SLS Actuators

Rigid, low-profile design ideal for space-sensitive applications.

BCS Actuators

Moderate load-carrying capacity cylinders are available in three body sizes

B3S Actuators

Heavy duty recirculating bearing system for high load-carrying and moment capacity available in three body sizes.

U.S. STANDARD SCREW-DRIVE ACTUATORS

MODEL AVAILABILITY AND LEADSCREW THRUST/SPEED CAPACITY

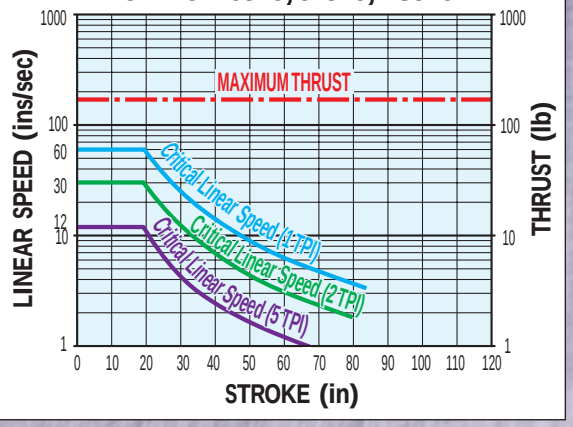
BCS CYLINDER-STYLE Model Number		Screw Dia. (in)	Screw Form	Pitch (turns per in)	Nut Style
BCS10	SN01	1/2	STD	1	Solid
BCS10	SN02	1/2	STD	2	Solid
BCS10	SNA02	1/2	STD	2	Solid
BCS10	SN05	1/2	STD	5	Solid
BCS10	BN08	3/8	PRE	8	Ball
BCS10	BNL08	3/8	PRE	8	Ball
BCS15	SN01	3/4	STD	1	Solid
BCS15	SN02	5/8	STD	2	Solid
BCS15	SNA02	5/8	STD	2	Solid
BCS15	BN02	1/2	PRE	2	Ball
BCS15	BNL02	1/2	PRE	2	Ball
BCS15	BN05	5/8	PRE	5	Ball
BCS15	BNL05	5/8	PRE	5	Ball
BCS20	SN01	3/4	STD	1	Solid
BCS20	SN02	3/4	STD	2	Solid
BCS20	SNA02	3/4	STD	2	Solid
BCS20	BN02	3/4	PRE	2	Ball
BCS20	BNL02	3/4	PRE	2	Ball
BCS20	BN05	3/4	PRE	5	Ball
BCS20	BNL05	3/4	PRE	5	Ball

SLS SLIDE-STYLE Model Number		Screw Dia. (in)	Screw Form	Pitch (turns per in)	Nut Style
SLS10	SN01	1/2	STD	1	Solid
SLS10	SN02	1/2	STD	2	Solid
SLS10	SNA02	1/2	STD	2	Solid
SLS10	SN05	1/2	STD	5	Solid
SLS10	BN08	3/8	PRE	8	Ball
SLS10	BNL08	3/8	PRE	8	Ball

B3S CYLINDER-STYLE Model Number		Screw Dia. (in)	Screw Form	Pitch (turns per in)	Nut Style
B3S10	SN01	1/2	STD	1	Solid
B3S10	SN02	1/2	STD	2	Solid
B3S10	SNA02	1/2	STD	2	Solid
B3S10	SN05	1/2	STD	5	Solid
B3S10	BN08	3/8	PRE	8	Ball
B3S10	BNL08	3/8	PRE	8	Ball
B3S15	SN01	3/4	STD	1	Solid
B3S15	SN02	5/8	STD	2	Solid
B3S15	SNA02	5/8	STD	2	Solid
B3S15	BN02	1/2	PRE	2	Ball
B3S15	BNL02	1/2	PRE	2	Ball
B3S15	BN05	5/8	PRE	5	Ball
B3S15	BNL05	5/8	PRE	5	Ball
B3S20	SN01	3/4	STD	1	Solid
B3S20	SN02	3/4	STD	2	Solid
B3S20	SNA02	3/4	STD	2	Solid
B3S20	BN02	3/4	PRE	2	Ball
B3S20	BNL02	3/4	PRE	2	Ball
B3S20	BN05	3/4	PRE	5	Ball
B3S20	BNL05	3/4	PRE	5	Ball

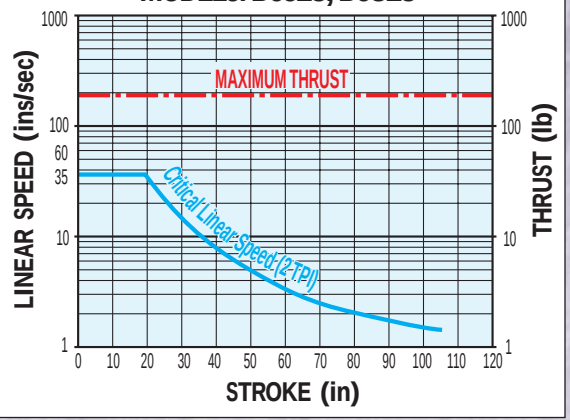
1/2" DIAMETER ACME SCREW

MODELS: BCS10, SLS10, B3S10



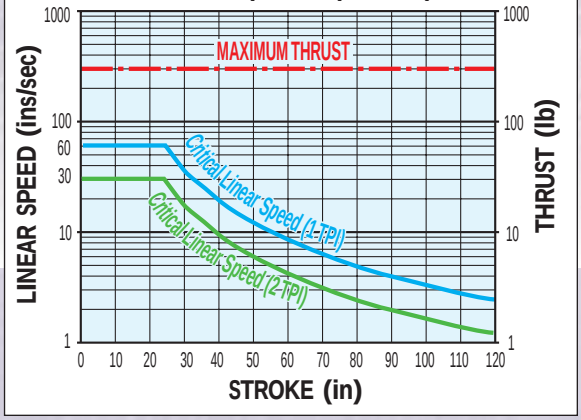
5/8" DIAMETER ACME SCREW

MODELS: BCS15, BC315



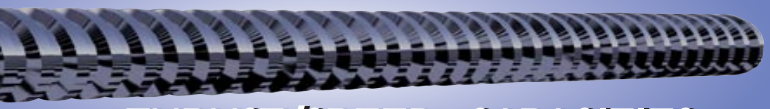
3/4" DIAMETER ACME SCREW

MODELS: BCS15, BCS20, B3S15, B3S20



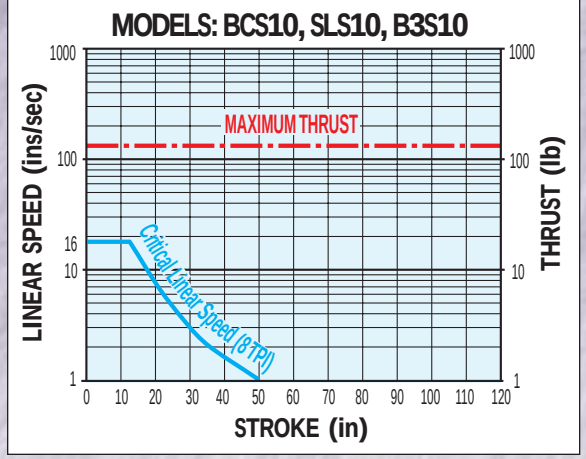
NOTE: See page 134 for configurator code descriptions.

U.S. STANDARD LEADSCREW

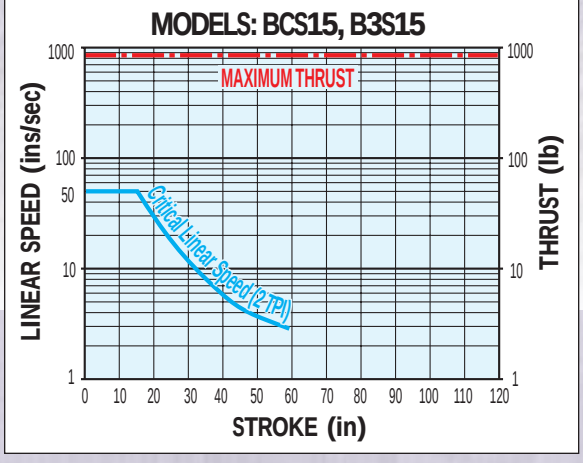


THRUST/SPEED CAPACITIES

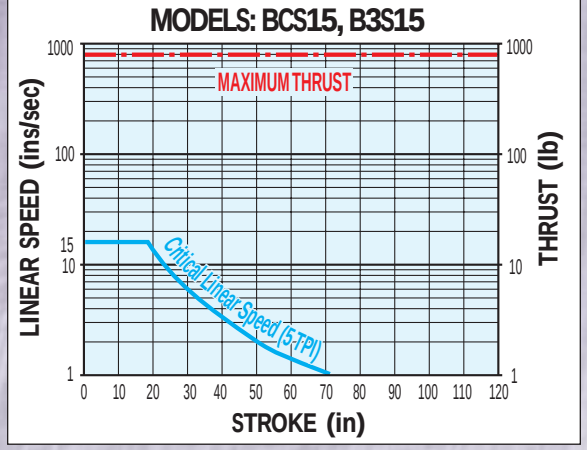
3/8" DIAMETER BALL SCREW



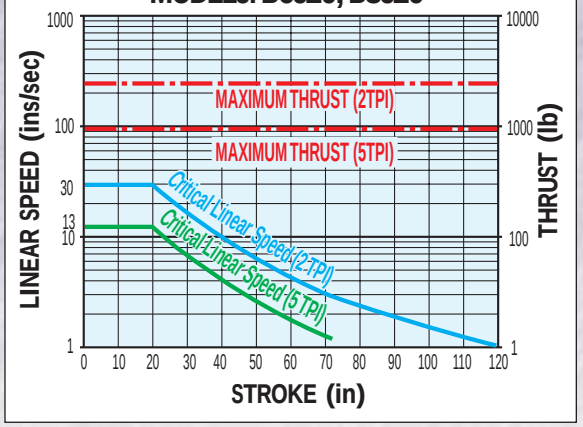
1/2" DIAMETER BALL SCREW



5/8" DIAMETER BALL SCREW



3/4" DIAMETER BALL SCREW



METRIC SCREW-DRIVE ACTUATORS

MODEL AVAILABILITY AND LEADSCREW THRUST/SPEED CAPACITY

METRIC MODELS

MCS CYLINDER-STYLE Model Number		Screw Dia. (mm)	Screw Form	Lead (mm per turn)	Nut Style
MCS10	SN25	12	ACME	25	Solid
MCS10	SN12	12	ACME	12	Solid
MCS10	BN02	10	Ball	2.5	Ball
MCS10	BNL02	10	Ball	2.5	Ball
MCS15	SN25	19	ACME	25	Solid
MCS15	SN12	15	ACME	12	Solid
MCS15	BN05	16	Ball	5	Ball
MCS15	BNL05	16	Ball	5	Ball
MCS20	SN25	19	ACME	25	Solid
MCS20	SN12	19	ACME	12	Solid
MCS20	BN05	20	Ball	5	Ball
MCS20	BNL05	20	Ball	5	Ball

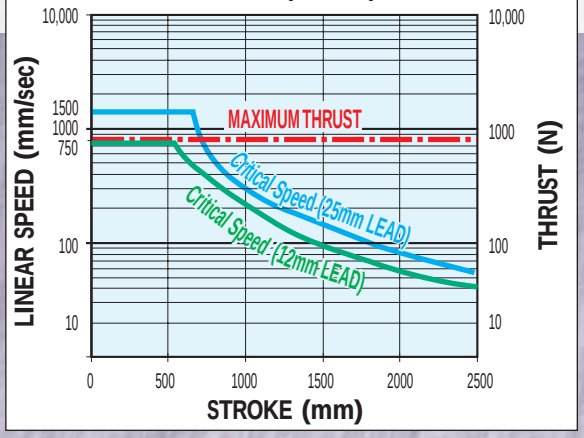
SLS SLIDE-STYLE Model Number		Screw Dia. (mm)	Screw Form	Lead (mm per turn)	Nut Style
SLS10	SN25	12	ACME	25	Solid
SLS10	SN12	12	ACME	12	Solid
SLS10	BN02	10	Ball	2.5	Ball
SLS10	BNL02	10	Ball	2.5	Ball

B3S CYLINDER-STYLE Model Number		Screw Dia. (mm)	Screw Form	Lead (mm per turn)	Nut Style
M3S10	SN25	12	ACME	25	Solid
M3S10	SN12	12	ACME	12	Solid
M3S10	BN02	10	Ball	2.5	Ball
M3S10	BNL02	10	Ball	2.5	Ball
M3S15	SN25	19	ACME	25	Solid
M3S15	SN12	15	ACME	12	Solid
M3S15	BN05	16	Ball	5	Ball
M3S15	BNL05	16	Ball	5	Ball
M3S20	SN25	19	ACME	25	Solid
M3S20	SN12	19	ACME	12	Solid
M3S20	BN05	20	Ball	5	Ball
M3S20	BNL05	20	Ball	5	Ball

NOTE: See page 134 for configurator code descriptions.

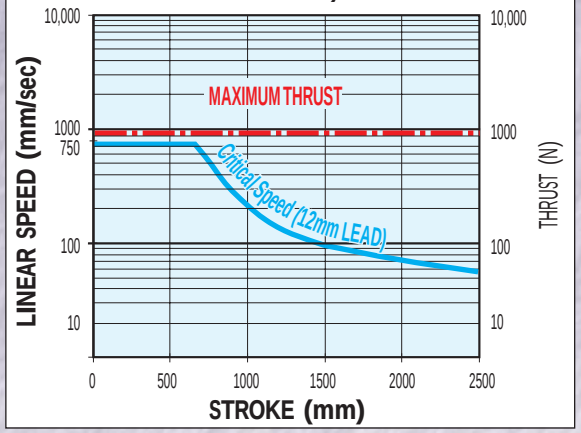
12mm DIAMETER ACME SCREW

MODELS: MCS10, SLS10, M3S10



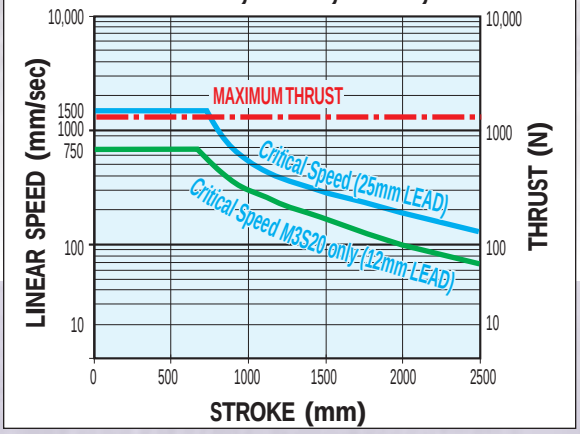
15mm DIAMETER ACME SCREW

MODELS: MCS15, M3S15

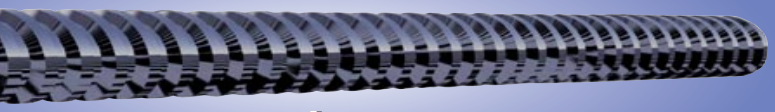


19mm DIAMETER ACME SCREW

MODELS: MCS15, MCS20, M3S15, M3S20

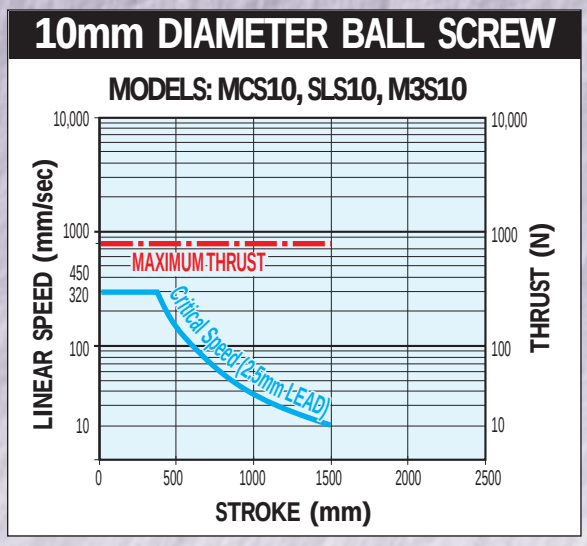


METRIC LEADSCREW

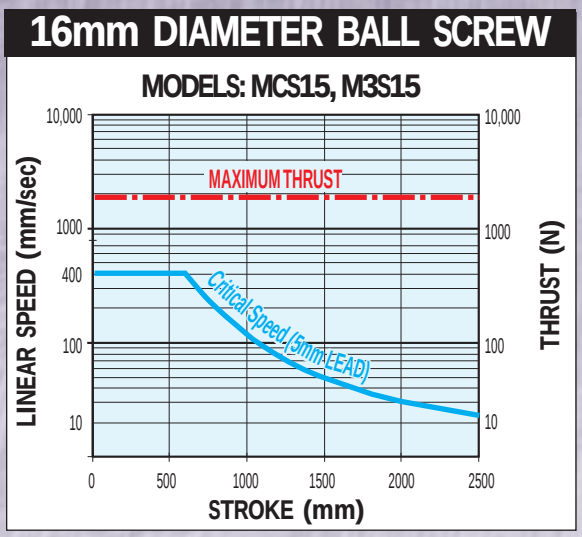


THRUST/SPEED CAPACITIES

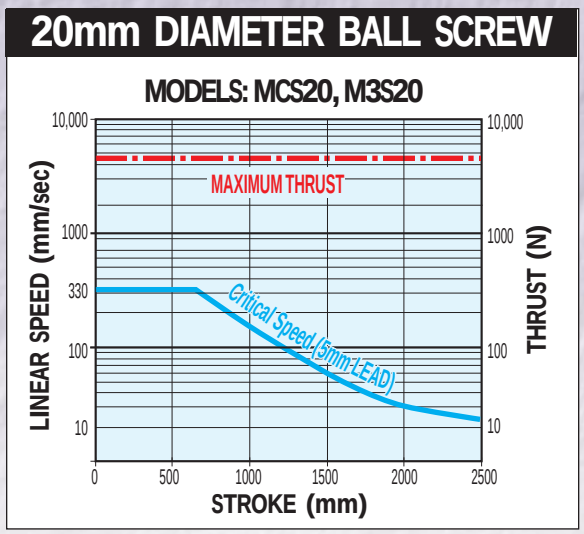
10mm DIAMETER BALL SCREW



16mm DIAMETER BALL SCREW

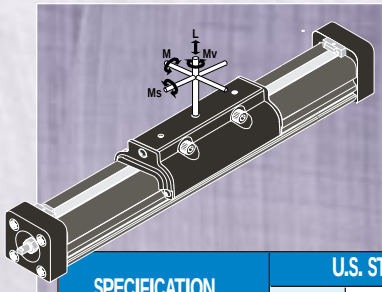


20mm DIAMETER BALL SCREW



BCS & MCS SERIES SCREW-DRIVE ACTUATORS

PERFORMANCE DATA • SPECIFICATIONS • DIMENSIONS

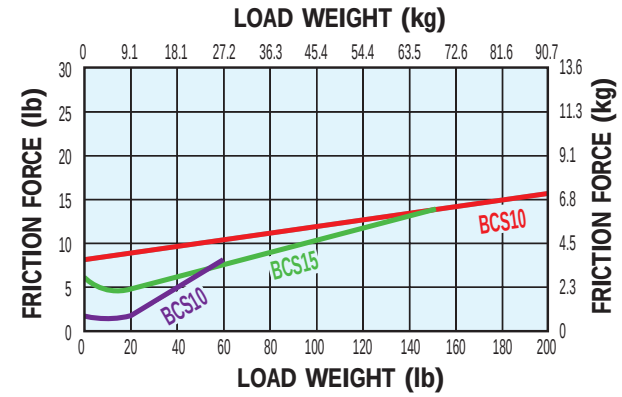


BCS/MCS SERIES SPECIFICATIONS

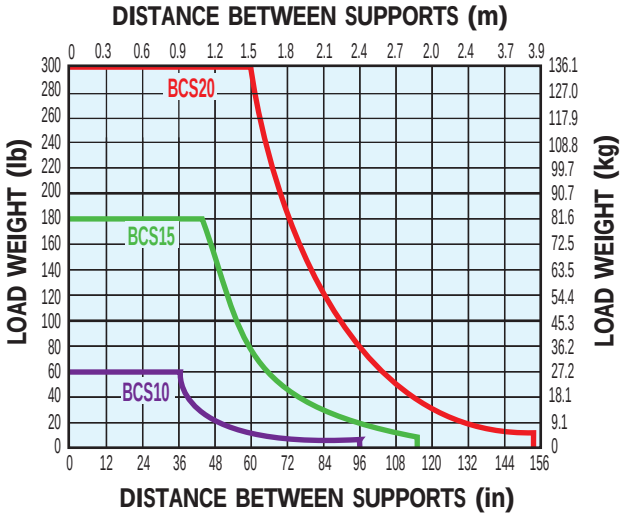
SPECIFICATION	U.S. STANDARD			METRIC		
	BCS10	BCS15	BCS20	MCS10	MCS15	MCS20
Max. Bending Moment*						
M	100 in-lb	500 in-lb	1100 in-lb	11.3 N-m	56.5 N-m	124.3 N-m
Ms	55 in-lb	275 in-lb	300 in-lb	6.2 N-m	31.1 N-m	33.9 N-m
Mv	30 in-lb	200 in-lb	325 in-lb	3.4 N-m	22.6 N-m	36.7 N-m
Max. Load						
L	60 lb	180 lb	300 lb	27.2 kg	81.6 kg	136.1 kg
Weights						
Carrier Weight	.69 lb	1.94 lb	2.81 lb	.31 kg	.88 kg	1.27 kg
Base Weight (incl. carrier)	2.91 lb	6.61 lb	14.59 lb	1.32 kg	2.9 kg	6.62 kg
Weight per length of stroke	.176 lb/in	.392 lb/in	.666 lb/in	3.1 g/mm	7.0 g/mm	11.9 g/mm
Pre-Load Torque	25 oz-in	30 oz-in	45 oz-in	.18 N-m	.21 N-m	.318 N-m
Dead Length (2 x S dim)	8.16 in	9.92 in	11.76 in	207.2 mm	252.0 mm	298.8 mm

*** For Dual Carrier option, refer to bending moment chart on page 88**

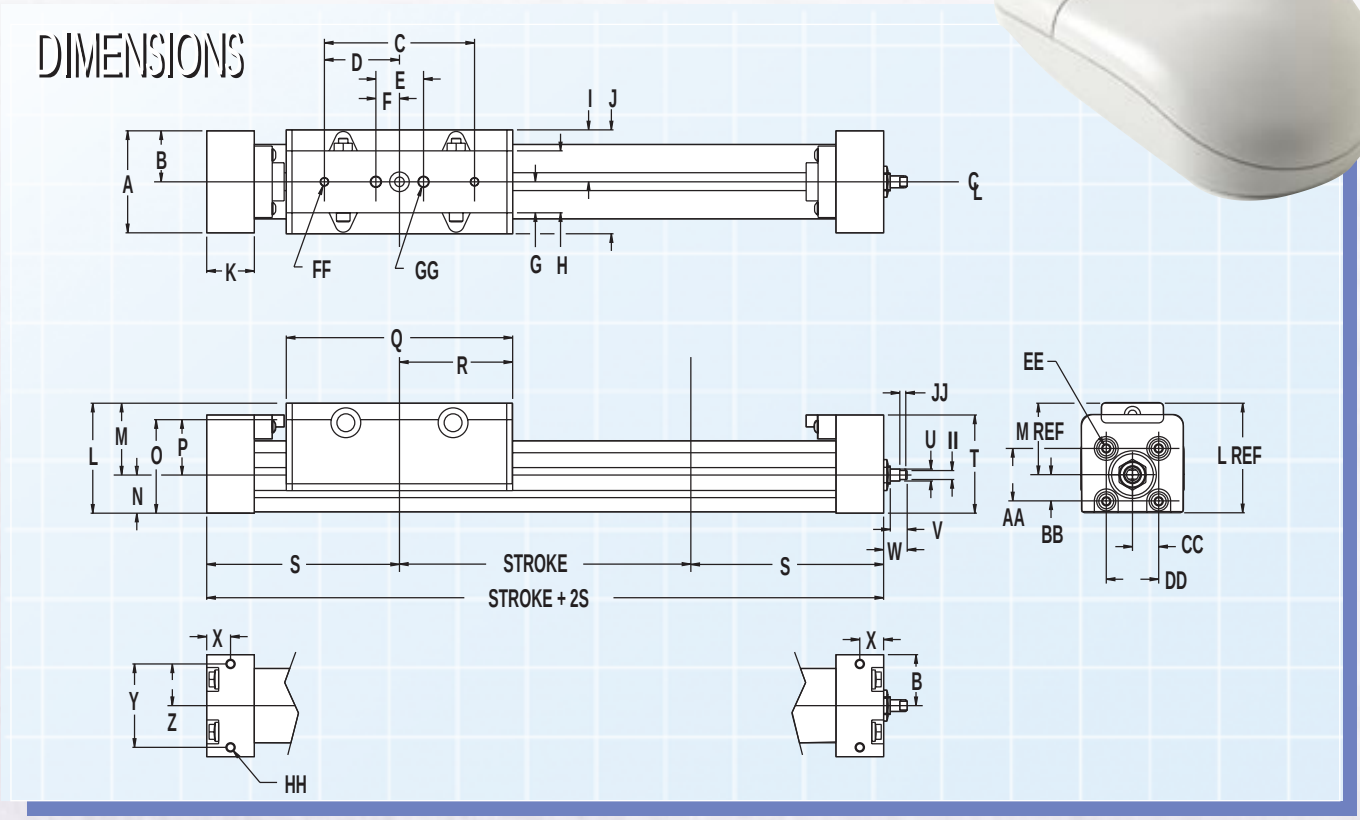
CARRIER FRICTION FORCE



TUBE SUPPORT REQUIREMENTS



REFERENCE CAD FILE: BCS10, BCS15 AND BCS20



All Dimensions in inches

MODELS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
BCS10	2.14	1.07	3.150	1.575	1.000	0.50	0.65	1.31	1.09	2.18	0.95	2.30	1.50	0.80	1.96	1.16	4.75
BCS15	2.88	1.44	4.250	2.125	1.000	0.500	0.90	1.80	1.75	3.50	1.25	3.54	2.13	1.41	2.91	1.50	5.91
BCS20	3.75	1.88	5.000	2.500	2.500	1.250	1.16	2.31	2.22	4.44	1.44	4.44	2.75	1.691	3.85	2.00	7.37

MODELS	R	S	T	U	U*	V	V†	W	W†	X	Y	Z	AA	BB	CC	DD
BCS10	2.38	4.08	2.06	0.250	—	0.46	1.46	0.55	1.55	0.500	1.750	0.875	1.100	0.550	0.550	1.100
BCS15	2.96	4.96	2.93	0.375	0.25	0.62	1.87	0.66	1.91	0.625	2.500	1.250	1.812	1.032	0.907	1.812
BCS20	3.68	5.88	3.62	0.438	—	0.81	2.31	0.81	2.31	0.720	3.120	1.560	2.250	1.250	1.125	2.250

MODELS	EE	FF	GG	HH	II	JJ
BCS10	10-24 X 0.43 DP	10-32 X 0.25 DP	1/4-20 X 0.25 DP	10-24 X 0.62 DP	0.19	0.15
BCS15	1/4-20 X 0.50 DP	5/16-18 X 0.37 DP	1/4-20 X 0.40 DP	1/4-20 X 0.62 DP	0.25	0.15
BCS20	5/16-28 X .875 DP	3/8-16 X .44 DP	3/8-16 X .44 DP	1/4-20 X .62 DP	0.25	0.19

*For 1/2" 2TPI SCREW style only.
† For EXTENDED SHAFT style only.

All Dimensions in millimeters

MODELS	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
MCS10	54.4	27.2	80.0	39.9	25.4	12.7	16.5	33.3	27.7	55.4	24.1	58.4	38.1	20.3	49.8	29.5	120.7
MCS15	73.2	36.6	180.0	54.1	25.4	12.7	22.9	45.7	44.5	88.9	31.8	89.9	54.1	35.8	73.9	38.1	150.1
MCS20	95.3	47.8	127.0	63.5	63.5	31.8	29.5	58.7	56.4	112.8	36.6	112.8	69.9	42.9	97.8	54.0	187.2

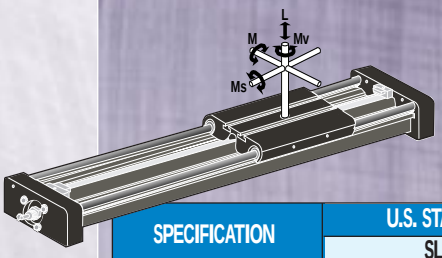
MODELS	R	S	T	U	V	V†	W	W†	X	Y	Z	AA	BB	CC	DD
MCS10	60.5	103.6	52.3	6.0	11.7	37.1	14.0	39.4	12.7	44.5	22.4	27.9	14.0	14.0	27.9
MCS15	75.2	126.0	74.4	8.0	15.8	47.5	16.8	48.5	15.9	63.5	31.8	46.0	26.2	23.1	46.0
MCS20	93.5	149.4	92.0	11.0	20.6	58.7	20.6	58.7	18.3	79.3	39.6	57.2	31.8	28.7	57.2

MODELS	EE	FF	GG	HH	II	JJ
MCS10	M5-0.8 X 11.0mm DP	M6-1.0 X 6mm DP	M6-1.0 X 6mm DP	M5-0.8 X 16mm DP	4.8	3.8
MCS15	M6-1.0 X 12mm DP	M8-1.25 X 10mm DP	M6-1.0 X 12mm DP	M6-1.0 X 16mm DP	6.0	3.8
MCS20	M8-1.25 X 22.2mm DP	M10-1.5 X 11mm DP	M10-1.5 X 11mm DP	M6-1.0 X 16mm DP	6.0	4.8

† For EXTENDED SHAFT style only.

SLS & MLS SERIES SCREW-DRIVE ACTUATORS

PERFORMANCE DATA • SPECIFICATIONS • DIMENSIONS

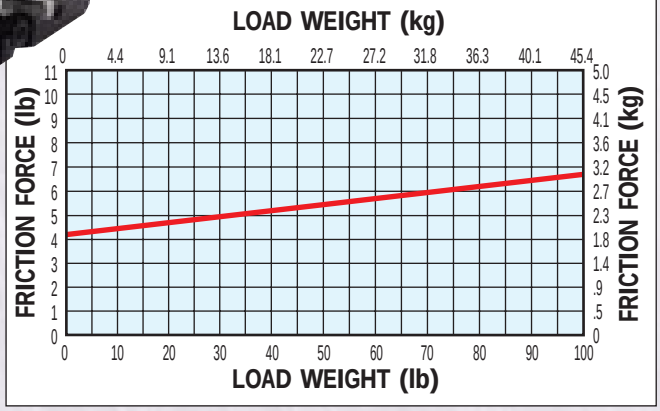


SLS/MLS SERIES SPECIFICATIONS

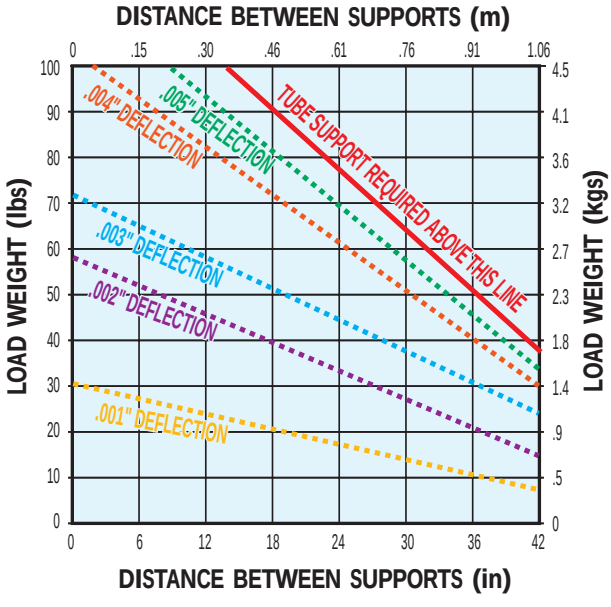
SPECIFICATION	U.S. STANDARD SLS10	METRIC MLS10
Max. Bending Moment*		
M	80 in-lb	9.0 N-m
Ms	80 in-lb	9.0 N-m
Mv	125 in-lb	14.1 N-m
Max. Load		
L	100 lb	45.4 kg
Weights		
Carrier Weight	1.54 lb	69 kg
Base Weight (incl. carrier)	6.05 lb	2.74 kg
Weight per length of stroke	.404 lb/in	7.23 g/mm
Pre-Load Torque	25 oz-in	.177 N-m
Dead Length (2 x S dim)	9.22 in	234.4 mm

*** For Dual Carrier option, refer to bending moment chart on page 88**

CARRIER FRICTION FORCE

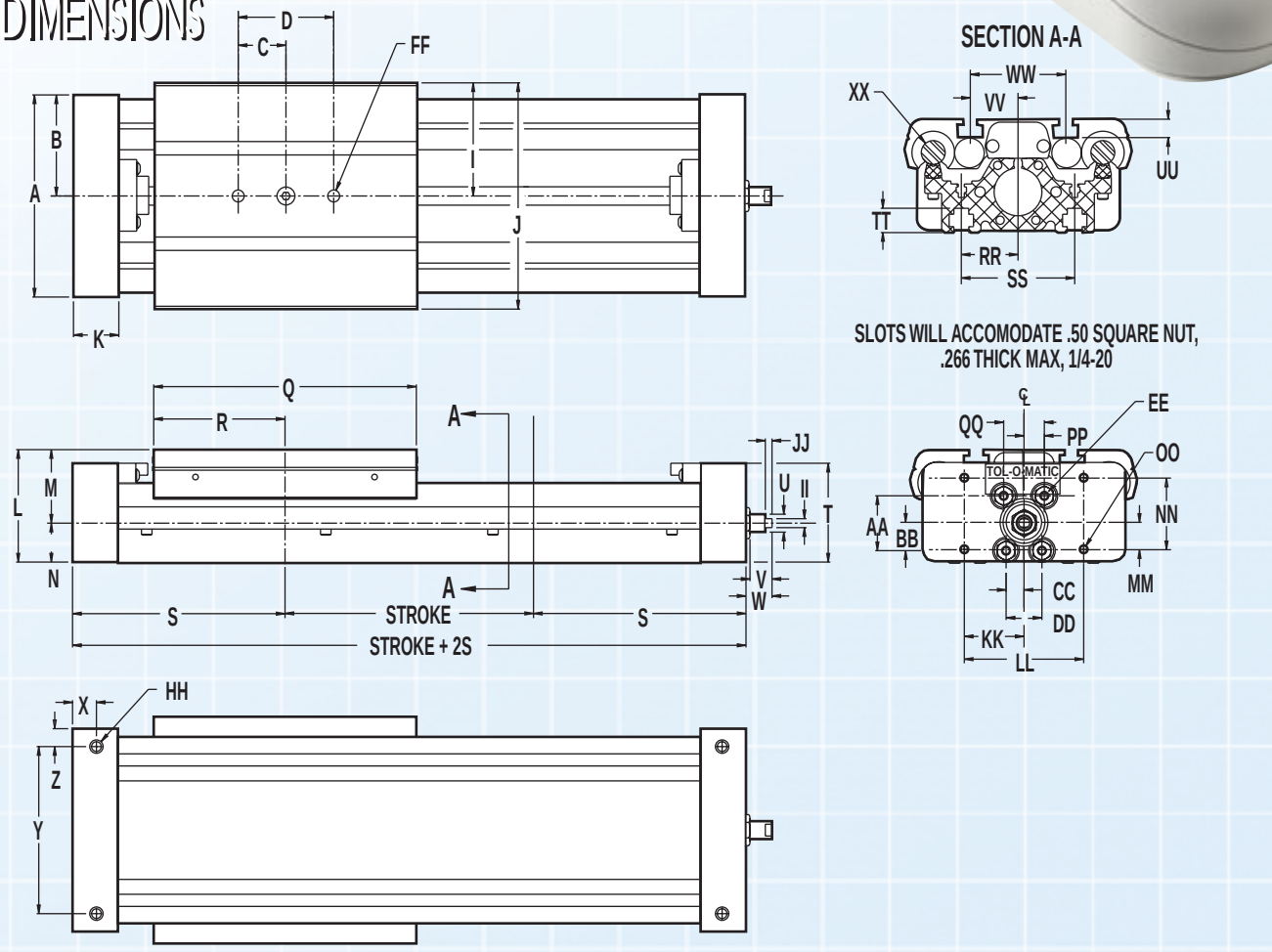


MOUNTING SUPPORT REQUIREMENTS


DISTANCE BETWEEN SUPPORTS (m)
0 .15 .30 .46 .61 .76 .91 1.06
LOAD WEIGHT (lbs)
0 10 20 30 40 50 60 70 80 90 100
LOAD WEIGHT (kgs)
0 .5 .9 1.4 1.8 2.3 2.7 3.2 3.6 4.1 4.5
.004" DEFLECTION
.005" DEFLECTION
TUBE SUPPORT REQUIRED ABOVE THIS LINE
.003" DEFLECTION
.002" DEFLECTION
.001" DEFLECTION
0 6 12 18 24 30 36 42
DISTANCE BETWEEN SUPPORTS (in)

REFERENCE CAD FILE: SLS10

DIMENSIONS



All Dimensions in inches

A	B	C	D	I	J	K	L	M	N	Q	R	S	T	U	V	V†	W
4.25	2.13	1.000	2.000	2.38	4.75	0.95	2.34	1.52	0.82	5.50	2.75	4.61	2.07	0.250	0.461	1.461	0.545

W†	X	Y	Z	AA	BB	CC	DD	EE	FF	HH	II	JJ	KK
1.545	0.500	3.500	0.375	1.149	0.59	0.375	0.75	#10-24 X 0.43 DP	Ø.250 X 0.200 DP	#10-24 X 0.63 DP	0.188	0.155	1.250

LL	MM	NN	OO	PP	QQ	RR	SS	TT	UU	VV	WW	XX
2.500	0.565	1.500	#10-24 X 0.50 DP	0.426	0.85	1.19	2.38	0.51	0.39	1.000	2.000	0.472

† For EXTENDED SHAFT style only.

All Dimensions in millimeters

A	B	C	D	I	J	K	L	M	N	Q	R	S	T	U	V	V†	W
107.9	54.0	25.40	50.80	60.3	120.6	24.1	59.4	38.7	20.7	139.7	69.8	117.2	52.6	6.4	11.7	37.1	13.8

W†	X	Y	Z	AA	BB	CC	DD	EE	FF	HH	II	JJ	KK
39.2	12.70	88.90	9.53	29.19	15.1	9.5	19.0	M5-0.8 X 11.0mm DP	Ø6.0 X 5.1mm DP	M5-0.8 X 16.0mm DP	5.0	3.9	31.75

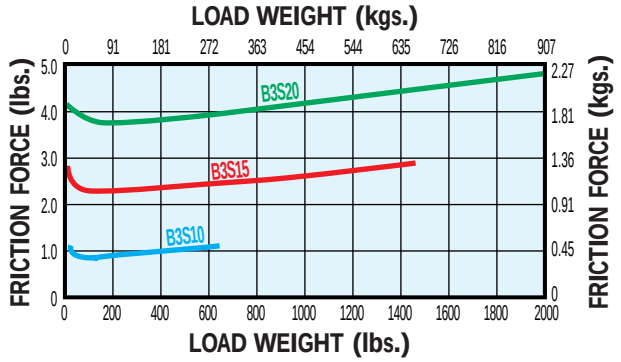
LL	MM	NN	OO	PP	QQ	RR	SS	TT	UU	VV	WW	XX
63.50	14.35	38.10	M5-0.8 X 24.1mm DP	10.8	21.6	30.2	60.3	12.9	9.8	25.40	50.80	12.0

† For EXTENDED SHAFT style only.

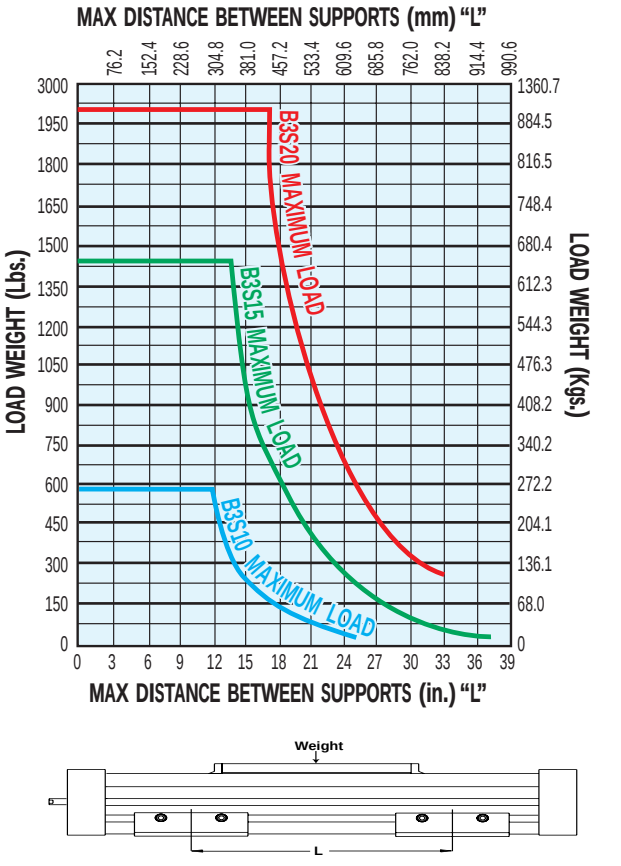
B3S & M3S SERIES SCREW-DRIVE ACTUATORS

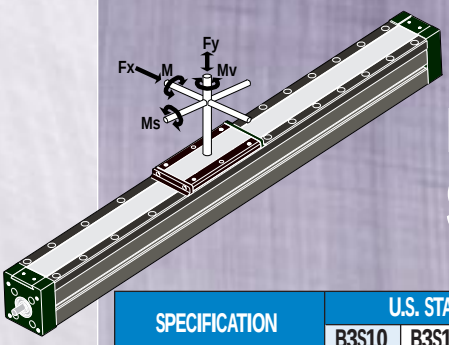
PERFORMANCE DATA • SPECIFICATIONS • DIMENSIONS

CARRIER FRICTION FORCE



TUBE SUPPORT REQUIREMENTS





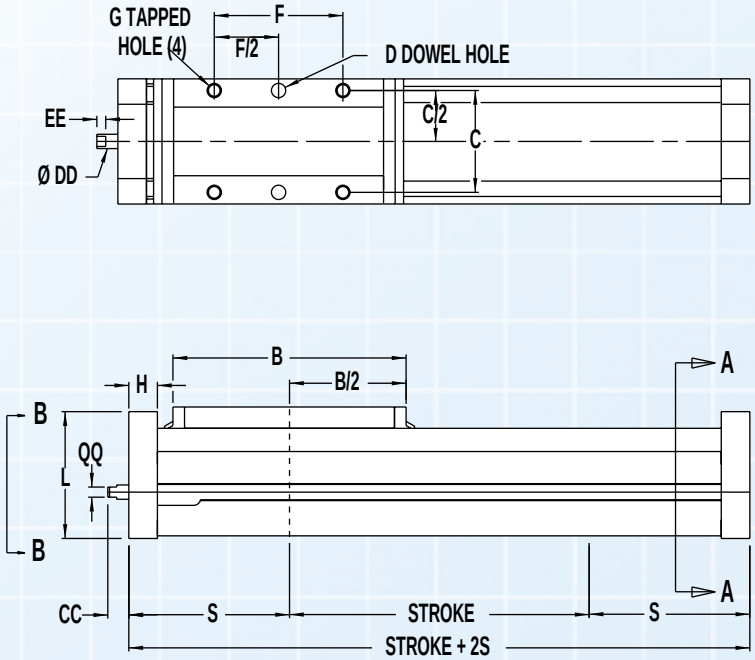
B3S/M3S SERIES SPECIFICATIONS

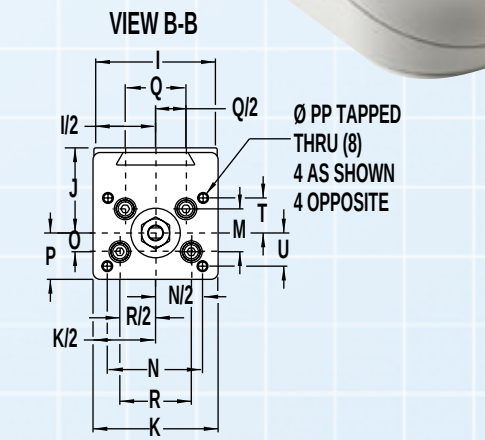
SPECIFICATION	U.S. STANDARD			METRIC		
	B3S10	B3S15	B3S20	M3S10	M3S15	M3S20
Max. Bending Moment*						
M	269 in-lb	1033 in-lb	1472 in-lb	30.4 N-m	116.7 N-m	166.3 N-m
Ms	250 in-lb	859 in-lb	1662 in-lb	28.2 N-m	97.1 N-m	187.8 N-m
Mv	156 in-lb	596 in-lb	850 in-lb	17.9 N-m	67.3 N-m	96.0 N-m
Max. Load						
Fy	591 lb	1454 lb	2008 lb	68.1 kg	659.5 kg	910.8 kg
Fx	341 lb	840 lb	1159 lb	154.7 kg	381.0 kg	525.7 kg
Weights						
Carrier Weight	.85 lb	1.56 lb	2.14 lb	.4 kg	.70 kg	.97 kg
Base Weight (incl. carrier)	2.15 lb	8.75 lb	14.38 lb	1.0 kg	3.96 kg	6.52 kg
Weight per length of stroke	.30 lb/in	.570 lb/in	.880 lb/in	5.4 g/mm	10.18 g/mm	15.73g/mm
Pre-Load Torque	25 oz-in	30 oz-in	50 oz-in	.177 N-m	.212 N-m	.353 N-m
Dead Length (2 x S dim)	5.62 in	8.376 in	10.52 in	142.8 mm	212.7 mm	267.2 mm

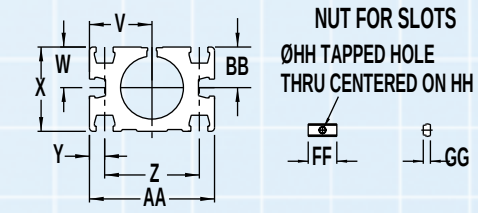
* For Dual Carrier option, refer to bending moment chart on page 88

REFERENCE CAD FILE: B3S10

DIMENSIONS







All dimensions in inches.

† For EXTENDED SHAFT Style Only

B	C	D*	F	G	H	I	J	K	L	M	N	O	P
3.67	1.781	.252/.251 x .25	2.250	1/4-20	0.50	2.16	1.54	2.25	2.29	.750	1.775	.328	.81

Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	CC†
1.063	1.250	2.81	.557	.557	1.094	.710	1.47	.266	1.656	2.19	.710	.550	1.75

DD	EE	FF	GG	HH	QQ	PP
.250	.156	.75	.25	#10-24	.177	#10-24

*DOWEL PINS ⌖ .003, 08mm Ⓜ

All dimensions in millimeters.

† For EXTENDED SHAFT Style Only

B	C	D*	F	G	H	I	J	K	L	M	N	O	P
93.3	45.24	6.05/6.02 X 64.	57.15	M6-1.0	12.7	54.8	39.1	57.2	58.2	19.05	45.085	8.33	20.57

Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	CC†
27.0	31.75	71.4	14.15	14.15	27.79	18.03	37.3	6.76	42.06	55.6	18.03	13.97	44.5

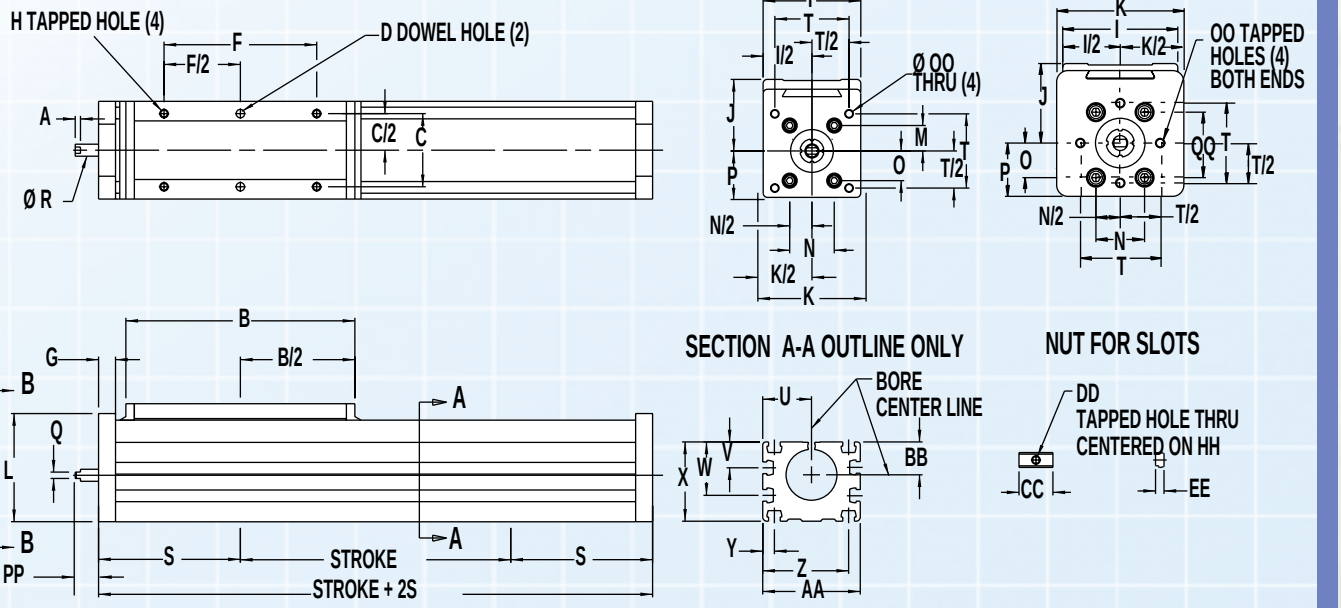
DD	EE	FF	GG	HH	QQ	PP
6.35	39.37	19.1	6.4	M5-0.8	4.50	4.78

B3S & M3S SERIES SCREW-DRIVE ACTUATORS

DIMENSIONS

REFERENCE CAD FILE: B3S15 or B3S20

DIMENSIONS



All dimensions in inches.

MODELS	A	B	C	D*	F	G	H	I	J	K	L	M	N	O
B3S15	.155	6.75	2.156	.252/.251 x .25	4.500	.500	1/4-20	2.88	2.109	3.00	3.18	.750	1.312.	875
B3S20	.19	7.25	3.125	.252/.251 X .25	4.750	1.31	5/16-18	3.84	2.66	4.25	4.20	—	1.625	1.156

MODELS	P	Q	R	S	T	U	V	W	X	Y	Z
B3S15	1.37	.188	.315** or .394	4.188	2.188	1.438	.762	1.575	2.34	.344	2.53
B3S20	1.78	.25	.500	5.26	2.668	1.969	1.016	2.141	3.16	.500	3.438

MODELS	AA	BB	CC	DD	EE	OO	PP	PP†	QQ
B3S15	2.88	.969	.94	1/4-20	.25	1/4-20	.688	1.95	—
B3S20	3.94	1.375	.94	5/16-18	.41	1/4-20	1.36	2.11	2.188

*DOWEL PINS ⌖ .003, 08mm Ⓜ

** For B3S15 BN02 and BCS15 BNLO2

† For EXTENDED SHAFT Style Only

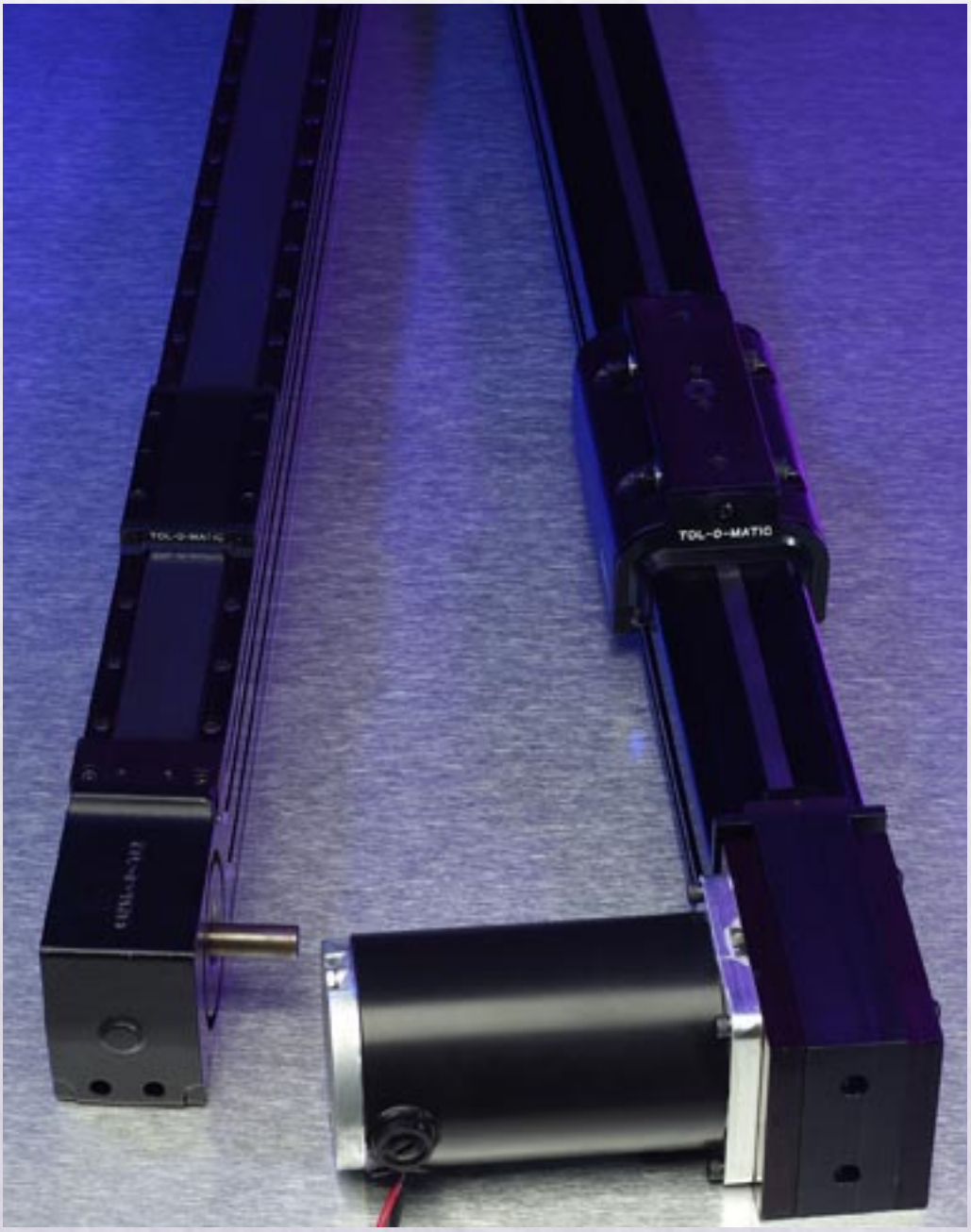
All dimensions in millimeters.

MODELS	A	B	C	D*	F	G	H	I	J	K	L	M	N	O
M3S15	3.94	171.5	54.76	6.05/6.02 x 6.4	114.30	12.70	M6-1.0	73.0	53.37	72.6	80.8	19.1	33.32	22.23
M3S20	4.8	184.1	79.3	6.05/6.02 X 6.4	120.65	33.2	M8-1.25	92.5	67.5	107.9	106.6	—	41.2	29.3

MODELS	P	Q	R	S	T	U	V	W	X	Y	Z
M3S15	34.7	4.57	8.0** or 10.0	106.4	55.58	36.53	19.35	40.00	59.4	8.74	64.29
M3S20	45.2	6.35	12.7	133.6	67.7	50.0	25.8	54.3	80.2	12.7	87.3

MODELS	AA	BB	CC	DD	EE	OO	PP	PP†	QQ
M3S15	73.0	24.61	23.8	M6-1.0	6.4	M6-1.0	17.48	49.5	—
M3S20	100.0	34.9	23.8	M8-1.25	10.4	M6-1.0	34.5	53.59	55.5

BELT-DRIVE ACTUATORS



Axidyne belt-drive actuators are available in two different body styles and bearing systems for applications requiring longer strokes and faster speeds.

B3B Series Actuators

Heavy duty recirculating bearing system for high load-carrying and moment capacity, available in three body sizes.

BCB Series Actuators

Moderate load-carrying capacity cylinder is available in one body size.

BELT-DRIVE ACTUATORS

MODEL AVAILABILITY • BELT LOAD CAPACITIES • BELT CONSTRUCTION

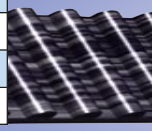
U.S. STANDARD MODELS

BCB BELT-STYLE Model Number	Drive Reduction	Belt Width	Belt Material
BCB15	DD_	BW05 (1/2")	P
BCB15	RD__	BW05 (1/2")	P
BCB15	DD_	BW07 (3/4")	N
BCB15	RD__	BW07 (3/4")	N
BCB15	SD_	BW05 (1/2")	P
BCB15	SD__	BW05 (1/2")	P
BCB15	SD_	BW07 (3/4")	N
BCB15	SD__	BW07 (3/4")	N

B3B BELT-STYLE Model Number	Drive Reduction	Belt Width	Belt Material
B3B10	SD_	BW05 (1/2")	N
B3B10	SD__	BW05 (1/2")	N
B3B15	SD_	BW10 (1")	N
B3B15	SD__	BW10 (1")	N
B3B20	SD_	BW18 (1.18")	N

METRIC MODELS

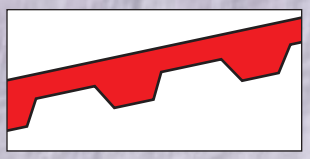
M3B BELT-STYLE Model Number	Drive Reduction	Belt Width	Belt Material
M3B10	SD_	BW05 (12.7mm)	N
M3B10	SD__	BW05 (12.7mm)	N
M3B15	SD_	BW10 (25.4mm)	N
M3B15	SD__	BW10 (25.4mm)	N
M3B20	SD_	BW18 (30mm)	N



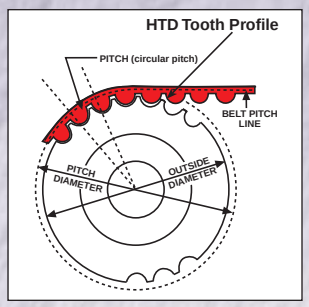
NOTE: See page 134 for configurator code descriptions.

BELT LOAD CAPACITIES AND BELT CONSTRUCTION

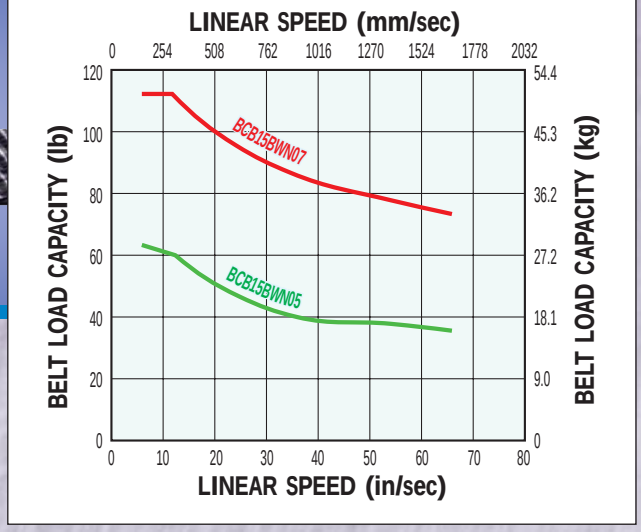
TRAPEZOIDAL TOOTH:
(BCB ACTUATORS)
Offered in polyurethane body with multi-strand steel tension members. Belt width is 1/2" and tooth pitch is 3/8". The trapezoidal tooth form is well suited for lighter load, lower horsepower applications with emphasis on positioning.



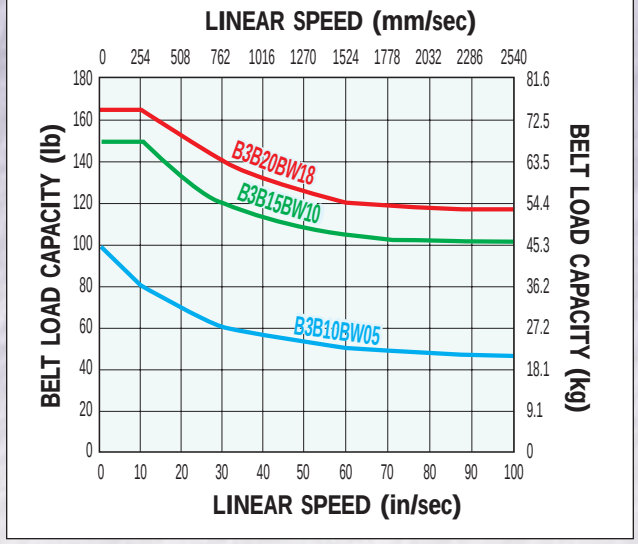
HTD TOOTH:
(BCB AND B3B ACTUATORS)
Offered in neoprene body with fiberglass tension members or in poly-kevlar. Belt width for B3B actuators is .5", 1" and 1.18"with 5mm tooth pitch. Belt width for BCB actuators is 3/4" with 5mm tooth pitch The HTD belt is selected for higher speed, higher load applications. Heavy duty drive and idler pulley bearings are used.



BELT LOAD FOR BCB ACTUATORS



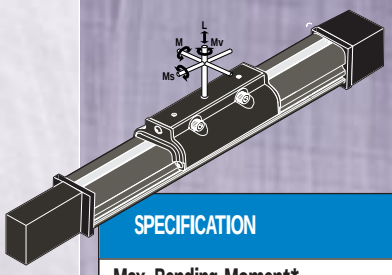
BELT LOAD FOR B3B ACTUATORS



BCB SERIES BELT-DRIVE ACTUATORS

PERFORMANCE DATA • SPECIFICATIONS • DIMENSIONS

Model is shown with direct drive motor mounting. See page 119 in the Motor Mounting and System Accessories section for more information on mounting configurations.

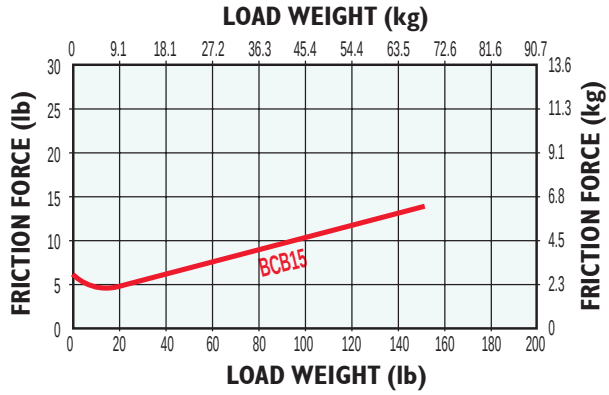


BCB SERIES SPECIFICATIONS

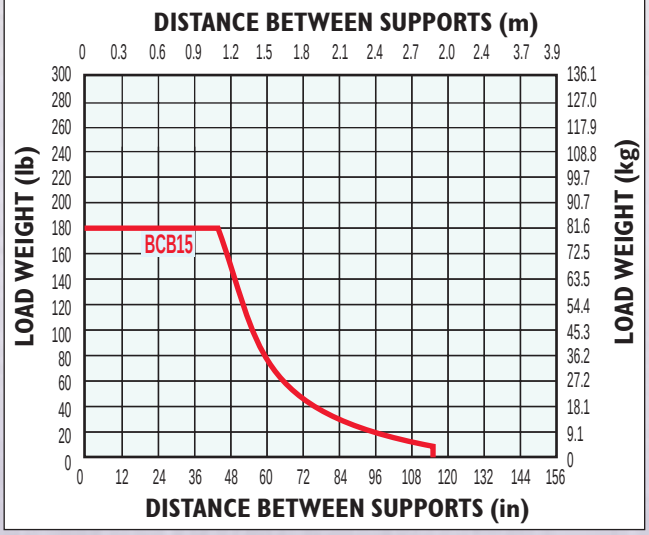
SPECIFICATION	U.S. STANDARD	
	BCB15BW05	BCB15BW07
Max. Bending Moment*		
M	500 in-lb (56.4 N-m)	500 in-lb (56.4 N-m)
Ms	275 in-lb (31.0 N-m)	275 in-lb (31.0 N-m)
Mv	200 in-lb (22.5 N-m)	200 in-lb (22.5 N-m)
Max. Load		
L	180 lb (81.6 kg)	180 lb (81.6 kg)
Weights		
Carrier Weight	1.94 lb (.87 kg)	1.94 lb (.87 kg)
Base Weight (incl. carrier)	8.40 lb (3.81 kg)	8.50 lb (3.85 kg)
Weight per length of stroke	0.33 lb/in (149.6 g/mm)	0.33 lb/in (149.6 g/mm)
Belt Weight per inch	0.044 oz (1.24 g)	0.067 oz (1.89 g)
Pre-Load Torque (at drive wheel)	10 oz-in (.070 N-m)	12 oz-in (1.355 N-m)
Drive Wheel Pitch Diameter	1.194 in (30.3 mm)	1.128 in (28.6 mm)
Inertia: Drive + Idler Wheel	0.46 oz-in² (84.13 g-cm²)	0.71 oz-in² (129.8 g-cm²)
Dead Length	17.18 in (436.3 mm)	17.18 in (436.3 mm)

* For Dual Carrier option, refer to bending moment chart on page 88

CARRIER FRICTION FORCE



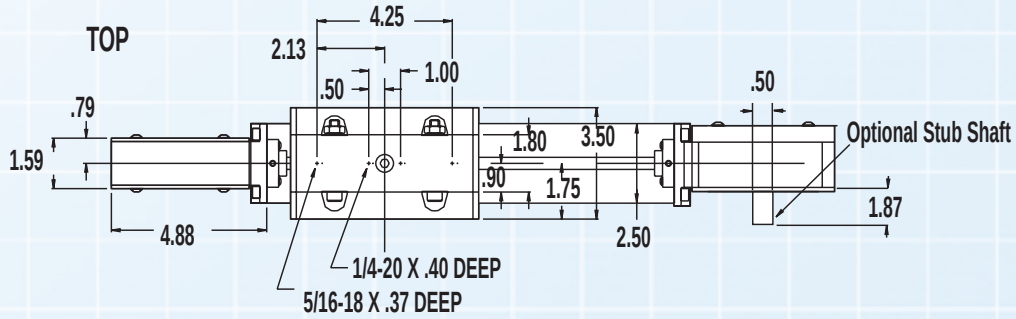
TUBE SUPPORT REQUIREMENTS

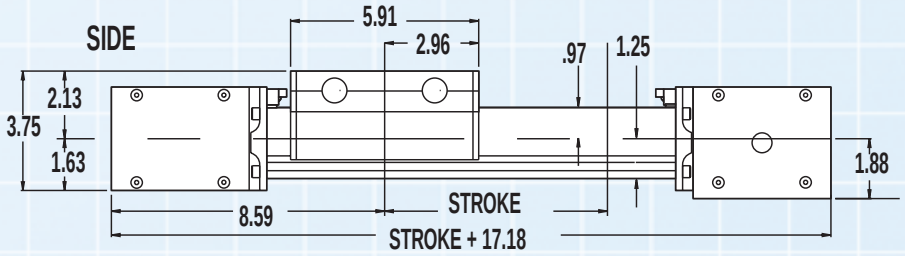


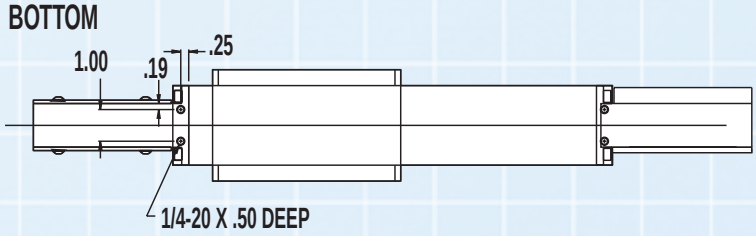
CLICK ON CAD FILE: BCB15

DIMENSIONS

All dimensions in inches.

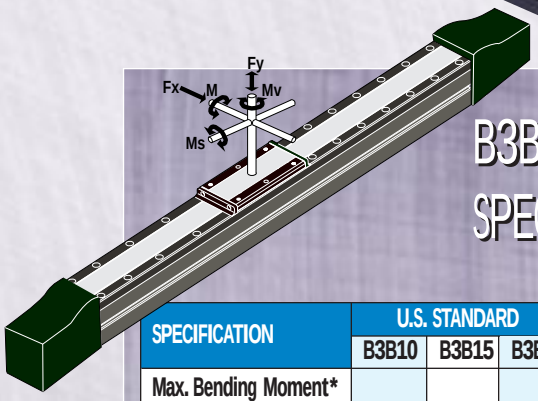






B3B & M3B SERIES BELT-DRIVE ACTUATORS

PERFORMANCE DATA • SPECIFICATIONS • DIMENSIONS

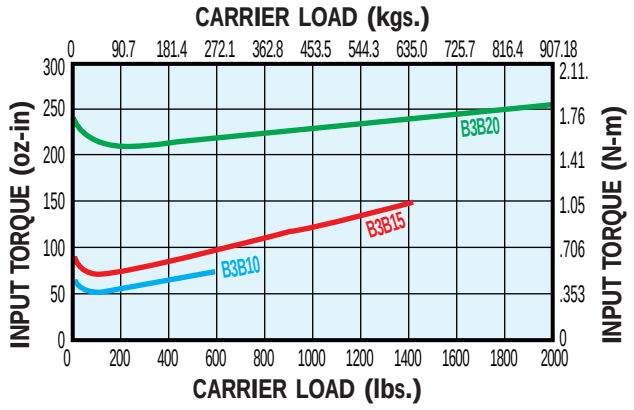


B3B/M3B SERIES SPECIFICATIONS

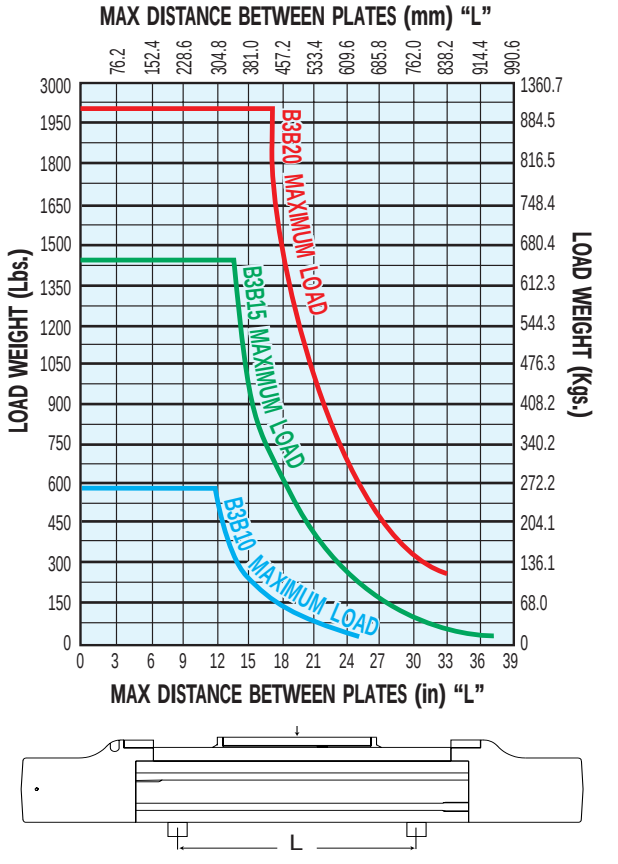
SPECIFICATION	U.S. STANDARD			METRIC		
	B3B10	B3B15	B3B20	M3B10	M3B15	M3B0
Max. Bending Moment*						
M 269 in-lb	1033 in-lb	1472 in-lb	30.4 N-m	116.7 N-m	166.3 N-m	
Ms 250 in-lb	859 in-lb	1662 in-lb	28.2 N-m	97.1 N-m	187.8 N-m	
Mv 156 in-lb	596 in-lb	850 in-lb	17.9 N-m	67.3 N-m	96.0 N-m	
Max. Load						
Fy 591 lb	1454 lb	2008 lb	68.1 kg	659.5 kg	910.8 kg	
Fx 341 lb	840 lb	1159 lb	154.7 kg	381.0 kg	525.7 kg	
Weights						
Carrier Weight	.85 lb	1.56 lb	2.14 lb	.4 kg	.70 kg	.97 kg
Base Weight (incl. carrier)	7.54 lb	25.12 lb	35.4 lb	3.4 kg	11.4 kg	6.52 kg
Weight per length of stroke	.388 lb/in	.394 lb/in	.714 lb/in	175.9 g/mm	178.7 g/mm	323.8 g/mm
Inertia:						
Drive + Idler Wheel	.501 oz-in^2	4.84oz-in^2	10.41oz-in^2	91.6 g-cm^2	185.2 g-cm^2	1903.9 g-cm^2
Pre-Load Torque	60 oz-in	90 oz-in	240 oz-in	.423 N-m	.635 N-m	1.694 N-m
Breakaway Torque (without carrier)	16 oz-in	30 oz-in	38 oz-in	.113 N-m	.212 N-m	.286 N-m
Dead Length (2 x A dim)	13.56 in	18.84 in	18.66 in	344.4 mm	478.5 mm	473.9 mm

* For Dual Carrier option, refer to bending moment chart on page 88

BREAKAWAY TORQUE/CARRIER LOAD

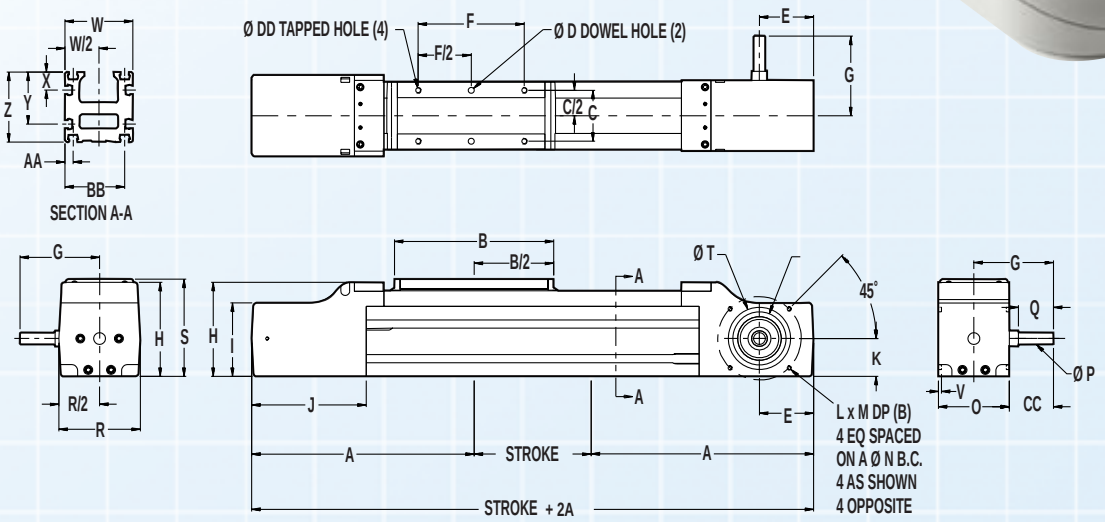


MOUNTING PLATE REQUIREMENTS



CLICK ON CAD FILE: B3B10, B3B15 or B3B20

DIMENSIONS



NOTE: All B3B actuators come with stub shafts as standard.

All Dimensions in inches

MODELS	A	B	C	D*	E	F	G	H	I	J	K	L	M	N	O	P
B3B10	6.78	4.08	1.781	.252/.251 X .25	2.06	2.148	2.96	3.25	3.00	3.81	1.500	#10-24	.50	3.536	2.188	.50
B3B15	9.42	6.75	2.156	.252/.251 X .25	2.29	4.500	3.37	3.98	3.11	4.85	1.602	#10-24	.50	3.536	3.000	.500
B3B20	9.33	7.25	3.125	.252/.251 X .25	1.79	4.750	3.84	4.49	3.25	4.60	1.75	#10-24	.50	3.536	3.938	.500

MODELS	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD
B3B10	NA	2.45	3.33	2.635	2.25	.13	2.19	.56	1.555	2.32	.27	1.922	1.87	1/4-20
B3B15	1.44	3.45	4.12	2.635	2.25	.13	2.88	.762	2.205	2.97	.344	2.531	1.87	1/4-20
B3B20	1.44	4.62	4.62	2.635	2.25	.13	3.94	.949	2.324	3.34	.50	3.438	1.87	1/4-20

*DOWEL PINS | ⌖ | .003, 08mm | Ⓜ

All Dimensions in millimeters

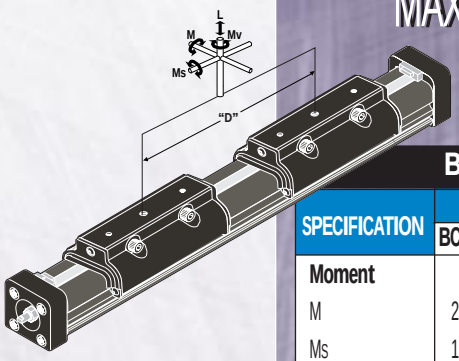
MODELS	A	B	C	D*	E	F	G	H	I	J	K	L	M	N	O	P
B3B10	172.2	103.6	45.24	6.05/6.02 X 6.4	52.3	54.56	59.0	82.6	76.2	96.8	38.10	M5 X .8	12.7	89.81	55.58	12.7
B3B15	239.2	171.5	54.76	6.05/6.02 X 6.4	58.3	114.30	85.7	101.1	79.0	123.2	40.69	M5 X .8	12.7	89.81	76.2	12.70
B3B20	237.0	184.2	79.38	.6.05/6.02 X 6.4	45.5	120.65	92.2	114.1	82.6	116.8	44.5	M5 X .8	12.7	89.81	100.03	12.70

MODELS	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD
B3B10	NA	64.5	84.6	66.93	57.2	3.2	55.63	14.2	39.50	58.93	6.86	48.82	47.5	M6 X 1.0
B3B15	38.1	87.6	104.6	66.93	57.2	3.2	73.2	19.35	56.00	75.44	8.74	64.29	47.5	M6 X 1.0
B3B20	36.57	108.2	117.4	66.93	57.2	3.2	100.1	21.10	59.03	84.8	12.7	87.33	47.5	M6 X 1.0

DUAL CARRIER

BCS, BCB, SLS, B3S AND B3B ACTUATORS

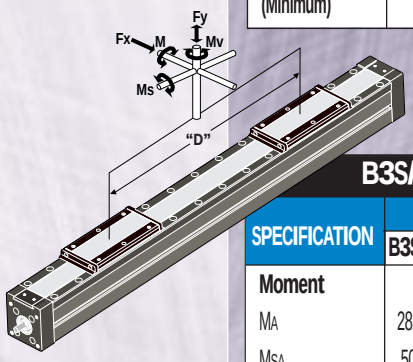
Available on all three body styles of Axidyne actuators, the Dual Carrier option increases rigidity, load carrying capacity and bending moments.



MAXIMUM BENDING MOMENTS AND LOADS

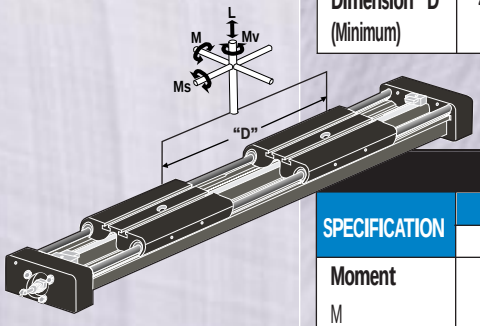
BCS/M3S AND BCB ACTUATORS

SPECIFICATION	U.S. STANDARD			METRIC		
	BCS(B)10	BCS(B)15	BCS(B)20	MCS(B)10	MCS(B)15	MCS(B)20
Moment						
M	287 in-lb	1453 in-lb	2430 in-lb	32.40 N-m	164.10 N-m	274.60 N-m
Ms	110 in-lb	550 in-lb	600 in-lb	12.40 N-m	62.10 N-m	67.80 N-m
Mv	287 in-lb	1453 in-lb	2430 in-lb	32.40 N-m	164.10 N-m	274.60 N-m
Load						
L	120 lb	360 lb	600 lb	54.40 kg	163.30 kg	272.20 kg
Dimension "D" (Minimum)	5.10 in	6.5 in	8.10 in	121 mm	165 mm	206 mm



B3S/M3S AND B3B/M3B ACTUATORS

SPECIFICATION	U.S. STANDARD			METRIC		
	B3S(B)10	B3S(B)15	B3S(B)20	M3S(B)10	M3S(B)15	M3S(B)20
Moment						
MA	2825 in-lb	11,734 in-lb	16,265 in-lb	319.2 N-m	1325.8 N-m	1837.8 N-m
MSA	500 in-lb	1718 in-lb	3324 in-lb	56.5 N-m	194.1 N-m	375.6 N-m
MVA	1630 in-lb	6779 in-lb	9388 in-lb	184.2 N-m	765.9 N-m	1060.8 N-m
Load						
FYA	1182 lb	2908 lb	4016 lb	536.1 kg	1319.0 kg	1821.6 kg
FXA	682 lb	1680 lb	2318 lb	309.3 kg	762.0 kg	1051.4 kg
Dimension "D" (Minimum)	4.88 in	8.07 in	8.10 in	124.4 mm	205.9 mm	205. 7 mm

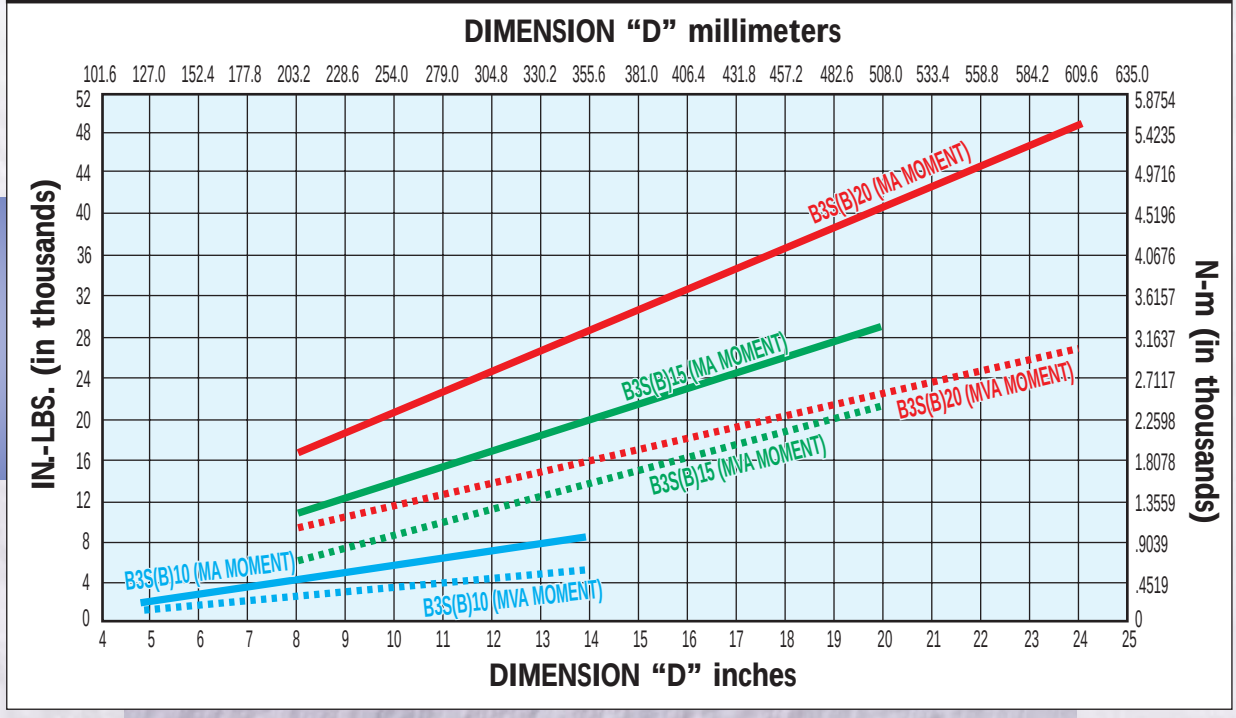


SLS/MLS ACTUATORS

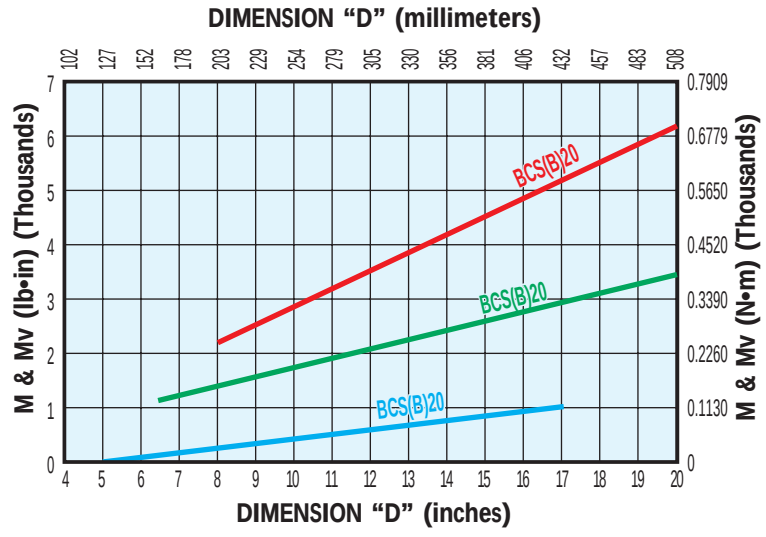
SPECIFICATION	U.S. STANDARD	METRIC
	SLS10	MLS10
Moment		
M	177.80 in-lb	20.09 N-m
Ms	160.00 in-lb	18.08 N-m
Mv	277.80 in-lb	31.30 N-m
Load		
L	200 lb	90.8 kg
Dimension "D" (Minimum)	5.5 in	139.7 mm

DUAL CARRIER LOAD vs. DISTANCE

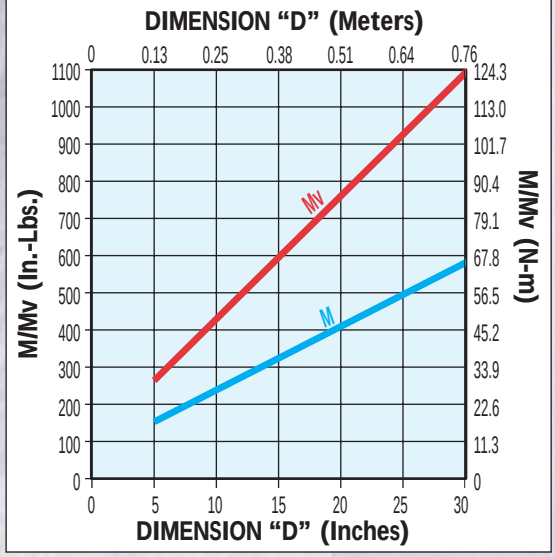
B3S/M3S AND B3B/M3B ACTUATORS



BCS/M3S AND BCB ACTUATORS



SLS/MLS ACTUATORS

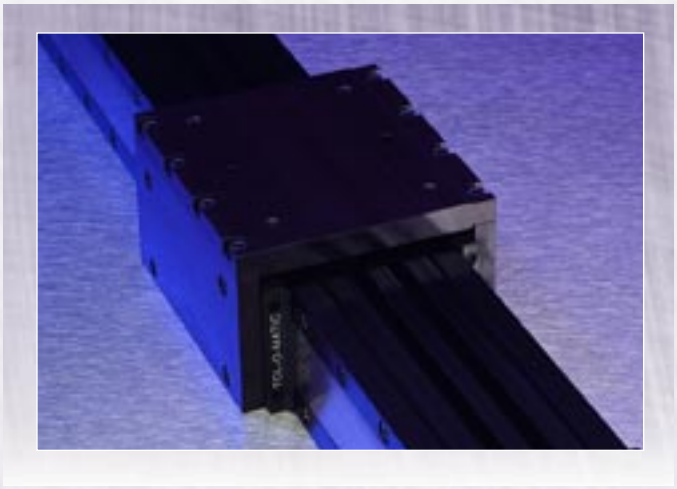


NOTE: Rates shown on charts were calculated with the following assumptions:
1.) Coupling between carriers is rigid.
2.) Load is equally distributed between carriers.
3.) Coupling device applies no misalignment loads to carriers.

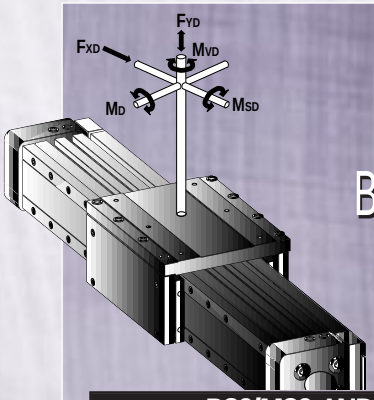
DUAL 180° CARRIER

B3S AND B3B ACTUATORS

The Dual 180° Carrier option may be used when load or deflection factors exceed those of a single carrier actuator. This option allows the load to be rotated 90° from the cylinder's carrier providing an additional load bearing surface.



NOTE: The Dual 180° Carrier option requires its own proprietary tube supports and foot mounts. See dimensional information. Breakaway torque will increase when using the Dual 180° Carrier option.



MAXIMUM BENDING MOMENTS AND LOADS

B3S/M3S AND B3B/M3B ACTUATORS

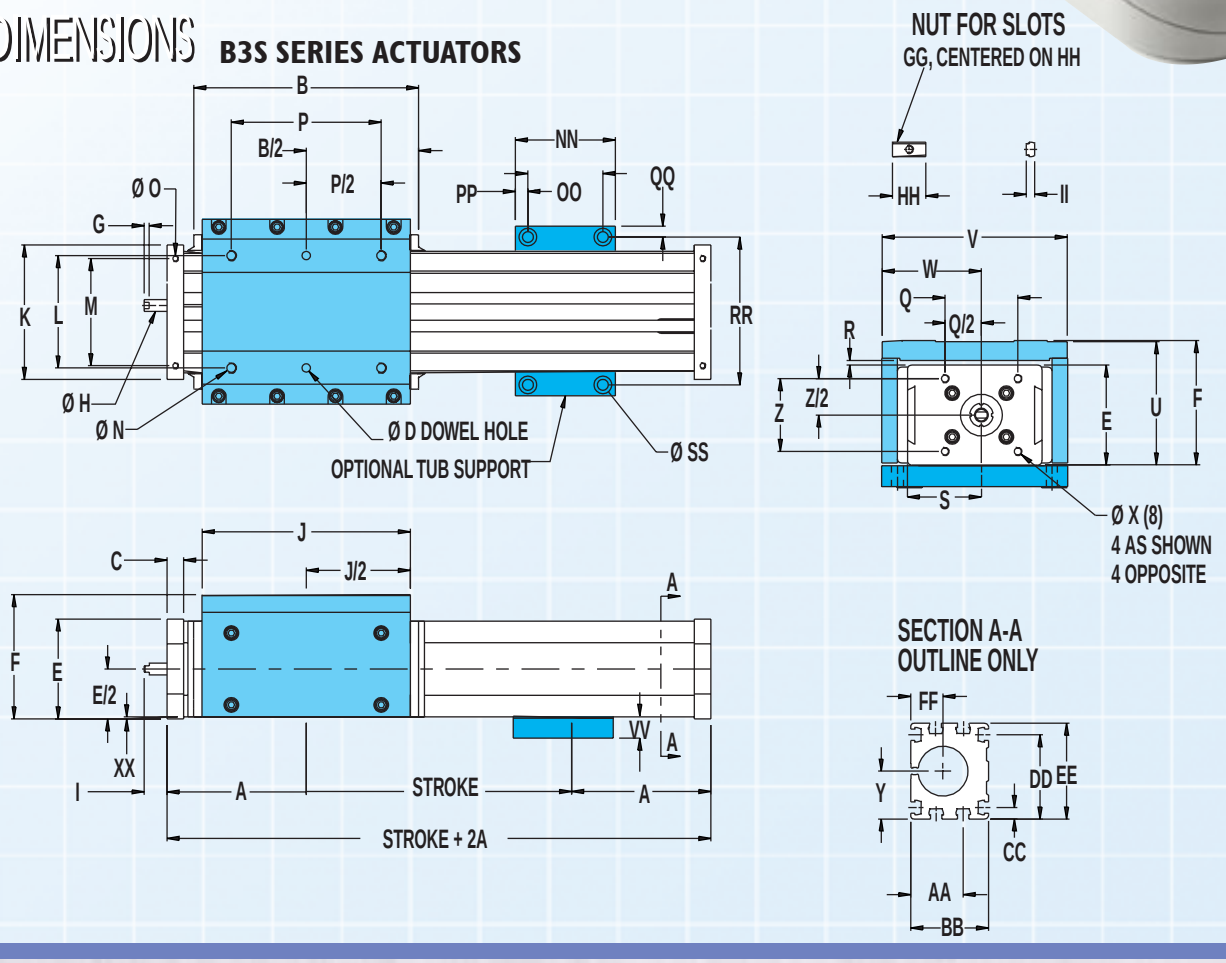
SPECIFICATION	U.S. STANDARD			METRIC		
	B3S(B)10	B3S(B)15	B3S(B)20	M3S(B)10	M3S(B)15	M3S(B)20
Moment						
MD	312 in-lb	1192 in-lb	1700 in-lb	35.3 N-m	134.7 N-m	192.1 N-m
MSD	657 in-lb	2468 in-lb	4527 in-lb	74.2 N-m	278.9 N-m	511.2 N-m
MVD	538 in-lb	2066 in-lb	2944 in-lb	60.8 N-m	233.4 N-m	332.6 N-m
Load						
FYD	1182 lb	2908 lb	4016 lb	536.1 kg	1319.0 kg	1821.6 kg
FXD	682 lb	1680 lb	2318 lb	309.3 kg	762.0 kg	1051.4 kg

DUAL 180° CARRIER WEIGHTS

SPECIFICATION	U.S. STANDARD			METRIC		
	B3S(B)10	B3S(B)15	B3S(B)20	M3S(B)10	M3S(B)15	M3S(B)20
Base Weight	2.66lb	6.26lb	11.88lb	1.2 kgs	2.8 kgs	5.4 kgs
Weight per/in of stroke	.087 lb	.16 lb	.26 lb	.04 kgs	.07 kgs	.12 kgs

CLICK ON CAD FILES: B3SD10, B3SD15, B3SD20

DIMENSIONS B3S SERIES ACTUATORS



B3S Series (All dimensions in inches)

MODELS	A	B	C	D*	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	U	V	W
B3SD10	2.81	3.67	0.50	252/.251 x .25	2.25	2.86	0.155	0.250	0.550	3.67	2.87	2.438	1.607	1/4-20 THRU	#10-24 x .375 DP	3.063	1.114	0.14	1.462	2.826	4.31	2.183
B3SD15	4.180	6.75	.500	252/.251 x .25	3.000	3.735	.155	.315 OR .394**	.688	6.25	4.038	3.375	3.218	5/16-18 THRU	#10-24 X .375 DP	4.500	2.188	.14	2.219	3.703	5.566	2.978
B3SD20	5.26	7.25	1.312	252/.251 x .25	4.25	4.83	0.190	0.500	1.360	6.75	5.25	5.125	3.845	3/8-18 THRU	1/4-20 x .50 DP	6.000	2.668	0.13	2.422	4.80	7.41	3.498

MODELS	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	NN	OO	PP	QQ	RR	SS	VV	WW	XX
B3SD10	#10-24 THRU	1.09	1.775	NA	1.47	0.266	1.922	2.19	0.710	#10-24 THRU	0.500	0.125	3.125	2.563	0.281	0.281	2.938	0.266	0.516	—	0.03
B3SD15	1/4-20 THRU	1.438	2.188	1.575	2.34	.344	2.188	2.88	.969	1/4-20 THRU	.94	.25	3.000	2.250	.375	.328	4.438	.530 THRU	0.656	4.328	.062
B3SD20	1/4-20 x .75 DP	1.969	2.668	2.14	3.16	0.500	3.438	3.94	1.375	3/8-18 THRU	0.94	.41	3.00	2.250	0.375	0.375	5.25	0.63	0.624	—	0.16

*DOWEL PINS .003, 08mm (M)

** .315 (8.0mm) for models B3SD15 BN02 and BNR02

M3S Series (All dimensions in millimeters)

MODELS	A	B	C	D*	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	U	V	W
M3SD10	71.4	93.2	12.70	6.05/6.02 x 6.4	57.2	72.6	3.94	6.35	13.97	93.2	72.9	61.93	40.82	M6 x 1.0 THRU	M5 x .8 x 10 DP	77.80	28.30	3.6	37.13	71.78	109.5	55.45
M3SD15	106.4	171.5	12.70	6.05/6.02 x 6.4	76.20	94.87	3.94	8.0 OR 10.0**	17.48	158.75	102.56	85.73	81.74	M8 x 1.25 THRU	M6 x 1.0 x 9.5 DP	114.3	55.58	3.6	56.36	102.57	94.06	141.12
M3SD20	133.6	184.2	33.32	6.05/6.02 x 6.4	108.0	122.7	4.83	12.70	34.54	171.5	133.4	130.18	97.66	8 x 1.25 THRU	6 x 1.0 12 DP	152.40	67.77	3.2	61.52	121.9	188.2	88.85

MODELS	X	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	NN	OO	PP	QQ	RR	SS	VV	WW	XX
M3SD10	M5 x .8 THRU	27.7	45.09	—	37.3	6.76	48.82	55.6	18.03	M5 x .8 THRU	12.70	3.18	79.38	65.10	7.14	7.14	74.63	6.76	13.11	—	0.8
M3SD15	M6 x 1.0 THRU	36.53	55.58	40.00	59.4	8.74	55.58	73.0	24.16	M6 x 1.0 THRU	23.9	6.4	76.20	57.15	8.89	8.33	112.73	13.46 THRU	16.66	109.93	1.57
M3SD20	M6 x 1.0 x 19 DP	50.01	67.77	54.4	80.26	12.70	87.33	100.1	34.93	8 x 1.25 THRU	23.9	10.4	76.2	57.15	9.53	9.53	133.4	16.0	15.85	—	4.1

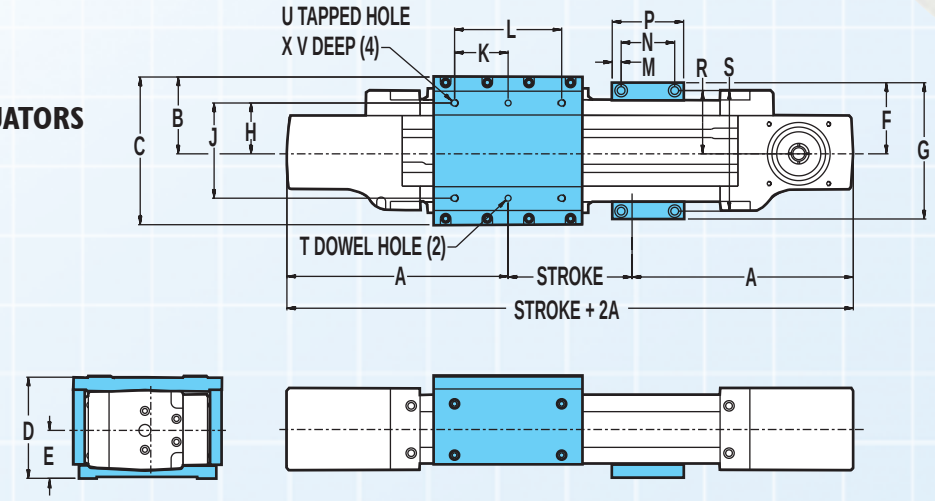
DUAL 180° CARRIER

FOR B3S AND B3B ACTUATORS

CLICK ON CAD FILE: B3BD10, B3BD15 AND B3BD20

DIMENSIONS

B3B SERIES ACTUATORS



B3B Series (All dimensions in inches)

MODELS	A	B	C	D	E	F	G	H	J	K	L	M	N
B3BD10	6.78	2.739	5.158	3.266	1.547	2.341	4.38	1.784	3.250	1.531	3.062	.28	1.438
B3BD15	9.42	3.225	6.203	4.250	2.016	2.987	5.72	2.114	4.000	2.250	4.500	.38	2.250
B3BD20	9.33	3.877	7.598	5.297	2.594	3.171	6.25	2.766	5.375	3.000	6.000	.38	2.250

MODELS	P	R	S	T	U	V
B3BD10	2.00	2.062	3.813	.252/.251 X .25	1/4-20	.47
B3BD15	3.00	2.657	5.062	.252/.251 X .25	5/16-18	.59
B3BD20	3.00	2.796	5.500	.252/.251 X .25	3./8-16	.66

M3B Series (All dimensions in millimeters)

MODELS	A	B	C	D	E	F	G	H	J	K	L	M	N
M3B10	172.2	69.5	131.0	82.9	39.2	59.4	111.2	45.3	82.5	38.8	77.7	7.1	36.5
M3B15	239.2	81.9	157.5	107.9	50.4	75.8	145.2	53.6	101.6	57.1	114.3	9.6	57.1
M3B20	236.9	98.4	192.9	134.5	65.8	80.5	158.7	70.2	136.5	76.2	152.4	9.6	57.15

MODELS	P	R	S	T	U	V
M3B10	50.8	52.3	96.8	6.4/6.3 X 6.4	1/4-20	11.9
M3B15	76.2	67.49	128.57	6.4/6.3 X 6.4	5/16-18	15.0
M3B20	76.2	71.02	139.70	6.40/6.38 x 6.4	3/8-16	16.8

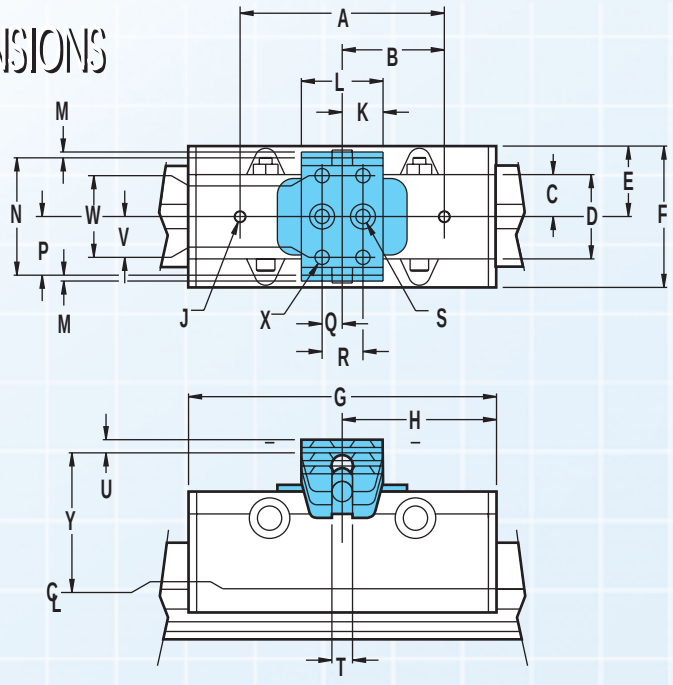
FLOATING MOUNT BRACKET

FOR BCS AND BCB ACTUATORS

Available on BCS and BCB screw- and belt-drive actuators, floating mount brackets should be used when independently-guided loads are not parallel to the actuator to eliminate actuator binding. Use of the floating mount bracket option adds .014" (0.36 mm) to backlash.

These bracket kits compensate for non-parallelism between the actuator and an external support/guidance system.

DIMENSIONS



BCS and BCB Series (All dimensions in inches)

MODELS	PART NO.	A	B	C	D	E	F	G	H	J	K	L	M
B(M)CS10	0510-9007	3.15	1.57	0.65	1.30	1.09	2.18	4.75	2.37	#10-32	0.63	1.26	0.13
B(M)CS(B)15	0515-9007	4.25	2.12	0.90	1.80	1.75	3.50	5.85	2.92	5/16"-18	1.77	3.54	0.27
B(M)CS20	0520-9007	5.00	2.50	1.16	2.31	2.22	4.44	7.37	3.68	3/8"-16	1.97	3.94	0.28

MODELS	PART NO.	N	P	Q	R	S	T	U	V	W	X	Y
B(M)CS10	0510-9007	1.81	0.90	0.31	0.62	0.22	0.31	0.15	—	—	—	1.99
B(M)CS(B)15	0515-9007	2.95	1.48	1.48	2.95	—	0.44	0.23	1.08	2.17	0.28	2.95
B(M)CS20	0520-9007	3.24	1.63	1.58	3.15	0.34	0.63	0.25	—	—	—	3.77

TUBE SUPPORTS

BCS, BCB AND B3S ACTUATORS

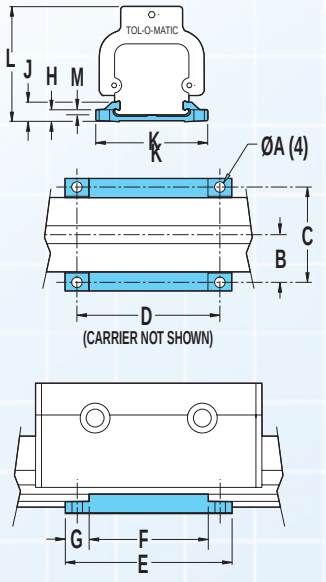
Designed to fit into dovetail grooves running the entire length of the cylinder tube, these black-anodized aluminum brackets are available for intermediate support of the actuator body.

The number of tube support brackets required and their placement depends on the overall length of the cylinder and the load weight being moved and supported (see actuator product pages for specific information).

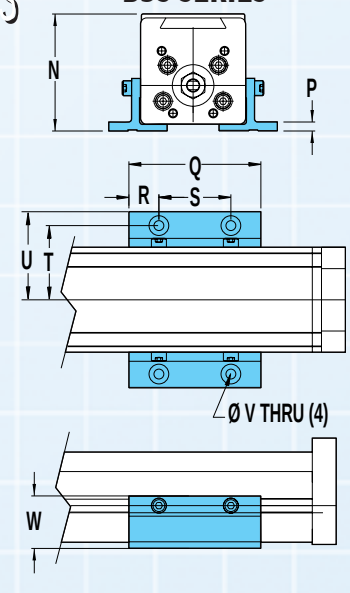
Tube support brackets for BCS and BCB actuators must be ordered with the cylinder order as they are mounted to the unit during assembly. (B3B and SLS actuators use mounting plates, for proper clearance see page 92)

DIMENSIONS

BCS and BCB SERIES



B3S SERIES



BCS and BCB Series (All dimensions in inches)

MODELS	PART NO.	A	B	C	D	E	F	G	H	J	K	L	M
B(M)CS10	4510-1010	0.22	1.00	2.00	3.00	3.50	2.50	0.50	0.25	0.41	2.36	2.43	0.14
B(M)CS(B)15	4515-1010	0.27	1.50	3.00	4.50	5.00	4.00	0.50	0.31	0.70	3.50	3.62	0.24
B(M)CS20	4520-1010	0.41	1.88	3.75	5.75	6.38	5.00	0.69	0.38	0.87	4.44	4.53	0.15

B3S Series (All dimensions in inches)

MODELS	PART NO.	N	P	Q	R	S	T	U	V	W
B(M)3S(B)10	3410-9006	2.438	.188	2.75	.25	2.250	1.53	1.76	.206	1.09
B(M)3S(B)15	3415-9006	3.624	.188	3.75	.38	3.000	1.97	2.19	.266	1.16
B(M)3S(B)20	3420-9006	4.53	.188	4.00	.31	3.375	2.56	2.84	.328	1.50

STANDARD MOUNTING AND MOUNTING PLATES

Standard Mounting Configurations

"T-Slot" Nuts

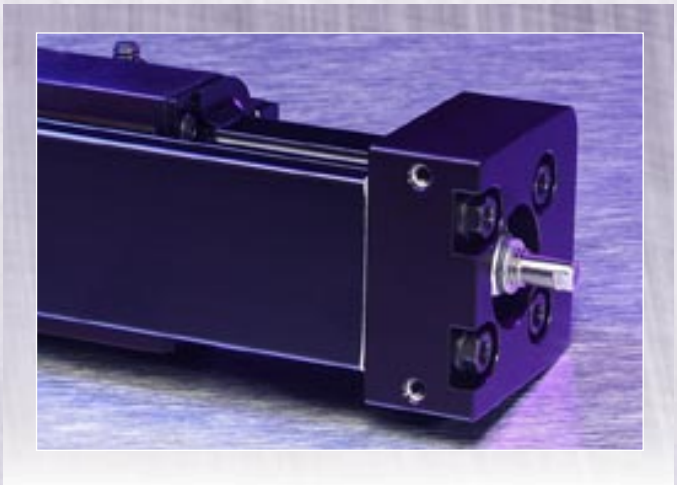
All SLS, B3S and B3B actuators are provided with T-nuts in the base of the cylinder body.

Four T-nuts for the first 24 inches of stroke is standard. Two nuts are provided for each additional 20 inches of stroke.

NOTE: *SLS10 tube and work table accept 1/4" threaded square nuts. MLS10 tube and work table accept M6 threaded square nuts.*

Tapped mounting holes

All BCS and BCB actuators are provided with mounting holes on the underside of the the cylinder heads. To mount, transfer location of holes to the receiving surface. Drill mounting holes 1/32" larger than diameter of the mounting screws and attach securely with appropriate screws.



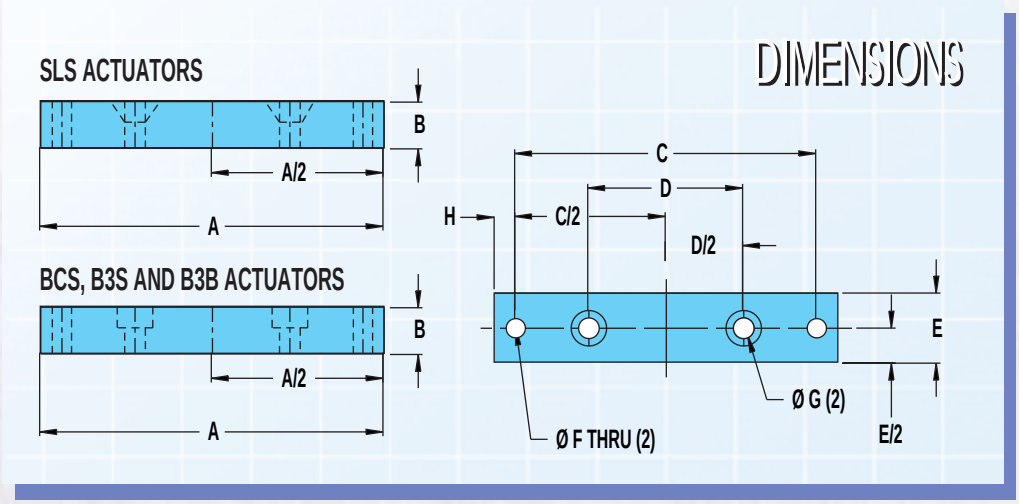
Axidyne actuators can be base mounted with standard mounting configurations provided or by using base mounting plates.

STANDARD MOUNTING AND MOUNTING PLATES

FOR B3S, B3B. BCS AND SLS ACTUATORS

Mounting Plates

Mounting Plates provide clearance height for motors and motor mounts when mounting an actuator on a flush surface. Designed to mount to either tapped mounting holes on cylinder heads or to T-Nuts, these plates provide the means for top mounting access. Kits include plates and mounting screws.



SLS, BCS, B3S and B3B Series (All dimensions in inches)

MODELS	PART NO.	A	B	C	D	E	F	G	H
SLS10	0610-9010	5.50	0.25	5.00	2.375	0.75	Ø 0.25	Ø.270 THRU, C'SINK Ø.531 X 82°	0.25
SLS10	0610-9045*	5.50	0.50	5.00	2.375	0.75	Ø 0.50	Ø.281 THRU, C'BORE Ø.44 X .28 DP	0.25
BCS10	0910-9133	3.75	1.00	2.940	1.750	0.75	Ø .22 (2)	Ø.22 THRU, C'BORE Ø.38 X .22 DP	0.41
BCS15	0915-9135	4.37	0.50	3.675	2.500	1.25	Ø.28 (2)	Ø.28 THRU, C'BORE Ø.43 X .28 DP	0.35
BCS20	0920-9038	5.25	1.00	4.550	3.125	0.35	Ø.28 (2)	Ø.28 THRU, C'BORE Ø.43 X .22 DP	0.35
B3S(B)10	3410-1232	3.52	0.50	3.060	1.656	.750	.206	Ø.221 THRU, C'BORE Ø.38 X .22 DP	.023
B3S(B)10	3410-1233	3.52	1.00	3.060	1.656	.750	.206	Ø.221 THRU, C'BORE Ø.38 X .22 DP	0.23
B3S(B)15	3415-1332	4.380	0.50	3.942	2.188	.750	.266	Ø.281 THRU, C'BORE Ø.44 X .22 DP	0.22
B3S(B)15	3415-1333	4.380	1.00	3.942	2.188	.750	.266	Ø.281 THRU, C'BORE Ø.44 X .22 DP	0.22
B3S(B)20	3420-1232	5.688	.50	5.125	2.938	.750	.328	Ø.344 THRU, C'BORE Ø.53 X .34 DP	0.28
B3SD10	3410-1269	4.26	.63	3.60	1.607	.63	.206	Ø.221 THRU, C'BORE Ø.38 X .22 DP	0.33
B3SD15	3415-1369	5.56	.63	4.72	3.218	.63	.266	Ø.221 THRU, C'BORE Ø.38 X .22 DP	0.42
B3SD20	3420-1269	7.30	.63	6.30	3.845	1.31	.391	Ø.281 THRU, C'BORE Ø.44 X .28 DP	0.50

*** These plates provide clearance for motors and motor mounts**

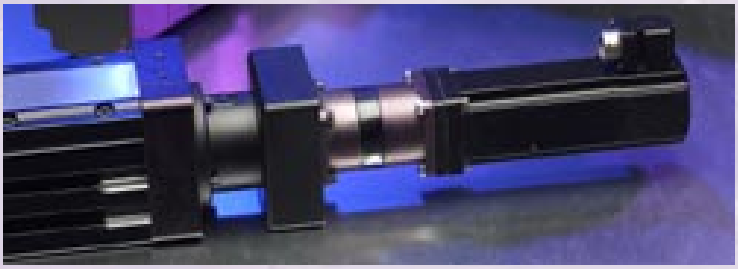
MOUNTING KIT/MOTOR COMPATIBILITY

MODELS	PART NO.	BRUSHED DC MOTORS	STEPPER MOTORS	BRUSHLESS SERVO
SLS10	0610-9045	MRB 231, 232	MRS 231, 232	—
SLS10	0610-9066	—	—	MRV 231, 232, 233, 234
SLS10	0610-9067	MRB 341, 342, 343	MRS 341, 342, 343	MRV 341, 342, 343
BCS10	0910-9133	MRB 231, 232, 341, 342, 343	MRS all frame sizes	MRV all frame sizes
BCS10	0510-9126	—	—	MRV 231, 232, 233, 234
BCS15	0915-9135	MRB all frame sizes	MRS 341, 342, 343	MRV all frame sizes
BCS20	0920-9038	MRB 341, 342, 343, 401, 402	MRS 341, 342, 343	MRV 341, 342, 343
B3S10	3410-9056	MRB 231, 232	MRS 231, 232	MRV 231, 232, 233, 234
B3S10	3410-9057	MRB 341, 342, 343	MRS 341, 342, 343	MRV all frame sizes
B3S15	3415-9056	MRB 231, 232	MRS 231, 232	MRV 231, 232, 233, 234
B3S15	3415-9057	MRB 341, 342, 343, 401, 402	MRS 341, 342, 343	MRV 341, 342, 343
B3S20	3420-9056	MRB all frame sizes	MRS all frame sizes	MRV all frame sizes
B3SD10	3410-9053	MRB 231, 232, 341, 342, 343	MRS all frame sizes	MRV all frame sizes
B3SD15	3415-9061	MRB all frame sizes	MRS all frame sizes	MRV all frame sizes
B3SD20	3420-9057	MRB all frame sizes	MRS all frame sizes	MRV all frame sizes
B3B10	3415-9056	MRB all frame sizes	MRS all frame sizes	MRV all frame sizes
B3B15	3420-9056	MRB all frame sizes	MRS all frame sizes	MRV all frame sizes
B3B20	3420-9056	MRB all frame sizes	MRS all frame sizes	MRV all frame sizes

Axidyne®
MOTOR
MOUNTING
AND
SYSTEM
ACCESSORIES
TOL-O-MATIC
F1 F2 F3 F4 F5
1 2 3 ↑ ↓
4 5 6 ← →
7 8 9 YES NO
0 SPACE BKSP ENTER

MOTOR MOUNTING SCREW-DRIVE ACTUATORS

MOUNTING KIT DIMENSIONS • COUPLER AND MOTOR MOUNT KIT SELECTION • GEARHEAD DIMENSIONS AND SELECTION



IN-LINE MOTOR MOUNTING

MOTOR MOUNTING KITS

Designed for a variety of dc and stepper motors, kits include mounting bracket, spacers and mounting bolts.
Shaft couplers are not included—see pages 99-102 for available selections.

GEARHEAD REDUCTION

Used in applications requiring reduction for inertia matching or higher torque at lower speeds.

REVERSE-PARALLEL MOUNTING

When overall length is a design constraint, these standard factory-assembled configurations allow offset mounting of the motor to either side of, or below the actuator. The options are available on BCS, MCS, B3S, and M3S screw drive cylinder-style actuators. They can be selected with appropriately rated Tol-O-Matic motors and with 1:1 or 2:1 drive ratio. Reverse-parallel units use a rugged toothed belt for quiet, zero-backlash coupling of the motor to the actuator screw shaft. The 2:1 reduction provides further options in motor selection for torque, speed and inertia match considerations.

SCREW-DRIVE COUPLERS & MOTOR MOUNT KITS

SELECTION • PARTS ORDERING INFORMATION

When selecting an actuator and motor system from Tol-O-Matic, the appropriate coupler and motor mounting kit is automatically selected for the system, based on the specific actuator and motor type chosen. The following tables summarize the couplings and motor mounting kits associated with Tol-O-Matic screw-drive actuators and motors. For couplings and motor mounting kits associated with gearheads for screw-drive actuators, refer to pages 103-108. Dimensional charts follow.

The **stepper** and **brushed dc** type servo system have been developed as low cost, moderate performance systems. For these systems, vibration isolation and shock damping, low cost, and tolerance to parallel and angular misalignment were the key selection criteria. Therefore, with these systems a jaw style coupler was selected. Motor mounting hardware for the stepper and brushed dc systems consists of a spacer, a motor mounting plate, and fasteners.

Brushless servos have been provided as the high performance solution (precision positioning with high reverse-load capability) and therefore, high torsional stiffness and zero backlash were the key criteria for coupling selection. For these systems flexible metal disc couplings with clamp-type mounting hubs were chosen. These couplers were sized based on the maximum thrust limit of the actuator, as a protective device for the actuator. Note that all 10 Series actuators using a SN01 or SN25 screw/nut use a jaw style coupler in servo applications due to adapter space limitations. Motor mounting hardware consists of a one piece adapter pinned to the actuator head for precision alignment.

BRUSH LESS

STEPPER

BRUSHED DC

B3S (US Standard)

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
B3S10 (SN01)	0.250"	+	MRV231	3600--6120	0.500"	=	COC51	3600-9213	3410-9201
B3S10 (SN01)	0.250"	+	MRV232	3600--6123	0.500"	=	COC51	3600-9213	3410-9201
B3S10 (SN01)	0.250"	+	MRV233	3600--6124	0.500"	=	COC51	3600-9213	3410-9201
B3S10 (SN01)	0.250"	+	MRV234	3600--6125	0.500"	=	COC51	3600-9213	3410-9201
B3S10 (others)	0.250"	+	MRV231	3600-6120	0.500"	=	ZOA51	3600-6163	3410-9201
B3S10 (others)	0.250"	+	MRV232	3600-6122	0.500"	=	ZOA51	3600-6163	3410-9201
B3S10 (others)	0.250"	+	MRV233	3600-6123	0.500"	=	ZOA51	3600-6163	3410-9201
B3S10 (others)	0.250"	+	MRV234	3600-6124	0.500"	=	ZOA51	3600-6163	3410-9201
B3S10	0.250"	+	MRB231	3600-6145	0.250"	=	COB11	3600-9204	3410-9050
B3S10	0.250"	+	MRS231	3600-6130	0.250"	=	COB11	3600-9204	3410-9050
B3S10	0.250"	+	MRS232	3600-6131	0.250"	=	COB11	3600-9204	3410-9050
B3S10	0.250"	+	MRS341	3600-6132	0.375"	=	COC21	3600-9206	3410-9078
B3S10	0.250"	+	MRS342	3600-6133	0.375"	=	COC21	3600-9206	3410-9078
B3S10 (others)	0.250"	+	MRS343	3600-6134	0.375"	=	COC21	3600-9206	3410-9078
B3S10 (others)	0.250"	+	MRB341	3600-6146	0.500"	=	COC51	3600-9213	3410-9078
B3S10 (others)	0.250"	+	MRB342	3600-6147	0.500"	=	COC51	3600-9213	3410-9078
B3S15 (all BN02)	0.315"	+	MRB231	3600-6145	0.250"	=	COC13	3415-9039	3415-9087
B3S15 (all BN02)	0.315"	+	MRS231	3600-6130	0.250"	=	COC13	3415-9039	3415-9087
B3S15 (all BN02)	0.315"	+	MRS232	3600-6131	0.250"	=	COC13	3415-9039	3415-9087
B3S15 (all BN02)	0.315"	+	MRS341	3600-6132	0.375"	=	COC23	3415-9041	3415-9088
B3S15 (all BN02)	0.315"	+	MRS342	3600-6133	0.375"	=	COC23	3415-9041	3415-9088
B3S15 (all BN02)	0.315"	+	MRS343	3600-6134	0.375"	=	COC23	3415-9041	3415-9088
B3S15 (all BN02)	0.315"	+	MRB341	3600-6146	0.500"	=	COC53	3415-9043	3415-9088
B3S15 (all BN02)	0.315"	+	MRB342	3600-6147	0.500"	=	COC53	3415-9043	3415-9088
B3S15 (all BN02)	0.315"	+	MRV231	3600-6120	0.500"	=	ZOA53	3600-6169	3415-9201
B3S15 (all BN02)	0.315"	+	MRV232	3600-6122	0.500"	=	ZOA53	3600-6169	3415-9201
B3S15 (all BN02)	0.315"	+	MRV233	3600-6123	0.500"	=	ZOA53	3600-6169	3415-9201
B3S15 (all BN02)	0.315"	+	MRV234	3600-6124	0.500"	=	ZOA53	3600-6169	3415-9201
B3S15 (all BN02)	0.315"	+	MRV341	3600-6125	0.500"	=	ZOA53	3600-6169	3415-9200
B3S15 (all BN02)	0.315"	+	MRV342	3600-6126	0.500"	=	ZOA53	3600-6169	3415-9200
B3S15 (all BN02)	0.315"	+	MRV343	3600-6127	0.500"	=	ZOA53	3600-6169	3415-9200
B3S15 (others)	0.394"	+	MRB231	3600-6145	0.250"	=	COC19	3415-9040	3415-9087
B3S15 (others)	0.394"	+	MRS231	3600-6130	0.250"	=	COC19	3415-9040	3415-9087
B3S15 (others)	0.394"	+	MRS232	3600-6131	0.250"	=	COC19	3415-9040	3415-9087
B3S15 (others)	0.394"	+	MRS341	3600-6132	0.375"	=	COC29	3415-9042	3415-9088
B3S15 (others)	0.394"	+	MRS342	3600-6133	0.375"	=	COC29	3415-9042	3415-9088
B3S15 (others)	0.394"	+	MRS343	3600-6134	0.375"	=	COC29	3415-9042	3415-9088
B3S15 (others)	0.394"	+	MRB341	3600-6146	0.500"	=	COC59	3415-9044	3415-9088
B3S15 (others)	0.394"	+	MRB342	3600-6147	0.500"	=	COC59	3415-9044	3415-9088
B3S15 (others)	0.394"	+	MRB401	3600-6148	0.625"	=	COD69	3415-9046	3415-9204
B3S15 (others)	0.394"	+	MRB402	3600-6149	0.625"	=	COD69	3415-9046	3415-9204
B3S15 (others)	0.394"	+	MRV231	3600-6120	0.500"	=	ZOB59	3600-6170	3415-920

B3S (US Standard) Continued

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
B3S15 (others)	0.394"	+	MRV232	3600-6122	0.500"	=	ZOB59	3600-6170	3415-9201
B3S15 (others)	0.394"	+	MRV233	3600-6123	0.500"	=	ZOB59	3600-6170	3415-9201
B3S15 (others)	0.394"	+	MRV234	3600-6124	0.500"	=	ZOB59	3600-6170	3415-9201
B3S15 (others)	0.394"	+	MRV341	3600-6125	0.500"	=	ZOB59	3600-6170	3415-9200
B3S15 (others)	0.394"	+	MRV342	3600-6126	0.500"	=	ZOB59	3600-6170	3415-9200
B3S15 (others)	0.394"	+	MRV343	3600-6127	0.500"	=	ZOB59	3600-6170	3415-9200
B3S20	0.500"	+	MRB401	3600-6148	0.625"	=	COD65	3420-9042	3420-9204
B3S20	0.500"	+	MRB402	3600-6149	0.625"	=	COD65	3420-9042	3420-9204
B3S20	0.500"	+	MRV231	3600-6120	0.500"	=	ZOB55	3600-6173	3420-9201
B3S20	0.500"	+	MRV232	3600-6122	0.500"	=	ZOB55	3600-6173	3420-9201
B3S20	0.500"	+	MRV233	3600-6123	0.500"	=	ZOB55	3600-6173	3420-9201
B3S20	0.500"	+	MRV234	3600-6124	0.500"	=	ZOC55	3600-6174	3420-9201
B3S20	0.500"	+	MRV341	3600-6125	0.500"	=	ZOC55	3600-6174	3420-9200
B3S20	0.500"	+	MRV342	3600-6126	0.500"	=	ZOC55	3600-6174	3420-9200
B3S20	0.500"	+	MRV343	3600-6127	0.500"	=	ZOC55	3600-6174	3420-9200
B3S20	0.500"	+	MRS231	3600-6130	0.250"	=	COC51	3600-9208	3420-9050
B3S20	0.500"	+	MRS232	3600-6131	0.250"	=	COC51	3600-9208	3420-9050
B3S20	0.500"	+	MRS341	3600-6132	0.375"	=	COC52	3600-9209	3420-9051
B3S20	0.500"	+	MRS342	3600-6133	0.375"	=	COC52	3600-9209	3420-9051
B3S20	0.500"	+	MRS343	3600-6134	0.375"	=	COC52	3600-9209	3420-9051
B3S20	0.500"	+	MRB231	3600-6145	0.250"	=	COC51	3600-9213	3420-9050
B3S20	0.500"	+	MRB341	3600-6146	0.500"	=	COC55	3600-9219	3420-9051
B3S20	0.500"	+	MRB342	3600-6147	0.500"	=	COC55	3600-9219	3420-9051

BRUSH LESS

STEPPER

BRUSHED DC

SCREW-DRIVE COUPLERS & MOTOR MOUNT KITS

SELECTION • PARTS ORDERING INFORMATION

M3S Style (Metric)

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
M3S10 (SN25)	6.35mm	+	MRV231	3600-6120	0.500"	=	COC51	3600-9213	4410-9201
M3S10 (SN25)	6.35mm	+	MRV231	3600-6122	0.500"	=	COC51	3600-9213	4410-9201
M3S10 (SN25)	6.35mm	+	MRV231	3600-6123	0.500"	=	COC51	3600-9213	4410-9201
M3S10 (SN25)	6.35mm	+	MRV231	3600-6124	0.500"	=	COC51	3600-9213	4410-9201
M3S10 (others)	6.35mm	+	MRV231	3600-6120	0.500"	=	ZOA51	3600-6163	4410-9201
M3S10 (others)	6.35mm	+	MRV232	3600-6122	0.500"	=	ZOA51	3600-6163	4410-9201
M3S10 (others)	6.35mm	+	MRV233	3600-6123	0.500"	=	ZOA51	3600-6163	4410-9201
M3S10 (others)	6.35mm	+	MRV234	3600-6124	0.500"	=	ZOA51	3600-6163	4410-9201
M3S10	6.35mm	+	MRB231	3600-6145	0.250"	=	COB11	3600-9204	4410-9050
M3S10	6.35mm	+	MRS231	3600-6130	0.250"	=	COB11	3600-9204	4410-9050
M3S10	6.35mm	+	MRS232	3600-6131	0.250"	=	COB11	3600-9204	4410-9050
M3S10	6.35mm	+	MRS341	3600-6132	0.375"	=	COC21	3600-9206	4410-9054
M3S10	6.35mm	+	MRS342	3600-6133	0.375"	=	COC21	3600-9206	4410-9054
M3S10	6.35mm	+	MRS343	3600-6134	0.375"	=	COC21	3600-9206	4410-9054
M3S10	6.35mm	+	MRB341	3600-6146	0.500"	=	COC51	3600-9213	4410-9054
M3S10	6.35mm	+	MRB342	3600-6147	0.500"	=	COC51	3600-9213	4410-9054
M3S15 (SN12)	8mm	+	MRB231	3600-6145	0.250"	=	COMC21	4520-9108	4415-9058
M3S15 (SN12)	8mm	+	MRS231	3600-6130	0.250"	=	COMC21	4520-9108	4415-9058
M3S15 (SN12)	8mm	+	MRS232	3600-6131	0.250"	=	COMC21	4520-9108	4415-9058
M3S15 (SN12)	8mm	+	MRS341	3600-6132	0.375"	=	COMC22	4520-9111	4415-9051
M3S15 (SN12)	8mm	+	MRS342	3600-6133	0.375"	=	COMC22	4520-9111	4415-9051
M3S15 (SN12)	8mm	+	MRS343	3600-6134	0.375"	=	COMC22	4520-9111	4415-9051
M3S15 (SN12)	8mm	+	MRB341	3600-6146	0.500"	=	COMC52	4520-9112	4415-9051
M3S15 (SN12)	8mm	+	MRB342	3600-6147	0.500"	=	COMC52	4520-9112	4415-9051
M3S15 (SN12)	8mm	+	MRB401	3600-6148	0.625"	=	COMD61	4520-9118	4415-9204
M3S15 (SN12)	8mm	+	MRB402	3600-6149	0.625"	=	COMD61	4520-9118	4415-9204
M3S15 (SN12)	8mm	+	MRV231	3600-6120	0.500"	=	ZOMB52	3600-6182	4415-9201
M3S15 (SN12)	8mm	+	MRV232	3600-6122	0.500"	=	ZOMB52	3600-6182	4415-9201
M3S15 (SN12)	8mm	+	MRV233	3600-6123	0.500"	=	ZOMB52	3600-6182	4415-9201
M3S15 (SN12)	8mm	+	MRV234	3600-6124	0.500"	=	ZOMB52	3600-6182	4415-9201
M3S15 (SN12)	8mm	+	MRV341	3600-6125	0.500"	=	ZOMB52	3600-6182	4415-9200
M3S15 (SN12)	8mm	+	MRV342	3600-6126	0.500"	=	ZOMB52	3600-6182	4415-9200
M3S15 (SN12)	8mm	+	MRV343	3600-6127	0.500"	=	ZOMB52	3600-6182	4415-9200
M3S15 (others)	10mm	+	MRB231	3600-6145	0.250"	=	COC19	3415-9040	4415-9058
M3S15 (others)	10mm	+	MRS231	3600-6130	0.250"	=	COC19	3415-9040	4415-9058
M3S15 (others)	10mm	+	MRS232	3600-6131	0.250"	=	COC19	3415-9040	4415-9058
M3S15 (others)	10mm	+	MRS341	3600-6132	0.375"	=	COC29	3415-9042	4415-9051
M3S15 (others)	10mm	+	MRS342	3600-6133	0.375"	=	COC29	3415-9042	4415-9051
M3S15 (others)	10mm	+	MRS343	3600-6134	0.375"	=	COC29	3415-9042	4415-9051
M3S15 (others)	10mm	+	MRB341	3600-6146	0.500"	=	COC59	3415-9044	4415-9051
M3S15 (others)	10mm	+	MRB342	3600-6147	0.500"	=	COC59	3415-9044	4415-9051
M3S15 (others)	10mm	+	MRB401	3600-6148	0.625"	=	COD69	3415-9046	4415-9204
M3S15 (others)	10mm	+	MRB402	3600-6149	0.625"	=	COD69	3415-9046	4415-9204
M3S15 (others)	10mm	+	MRV231	3600-6120	0.500"	=	ZOB59	3600-6170	4415-9201
M3S15 (others)	10mm	+	MRV232	3600-6122	0.500"	=	ZOB59	3600-6170	4415-9201
M3S15 (others)	10mm	+	MRV233	3600-6123	0.500"	=	ZOB59	3600-6170	4415-9201

M3S Style (Metric) Continued

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
M3S15 (others)	10mm	+	MRV234	3600-6124	0.500"	=	ZOB59	3600-6170	4415-9201
M3S15 (others)	10mm	+	MRV341	3600-6125	0.500"	=	ZOB59	3600-6170	4415-9200
M3S15 (others)	10mm	+	MRV342	3600-6126	0.500"	=	ZOB59	3600-6170	4415-9200
M3S15 (others)	10mm	+	MRV343	3600-6127	0.500"	=	ZOB59	3600-6170	4415-9200
M3S20	12.7mm	+	MRB401	3600-6148	0.625"	=	COD65	3420-9042	4420-9204
M3S20	12.7mm	+	MRB402	3600-6149	0.625"	=	COD65	3420-9042	4420-9204
M3S20	12.7mm	+	MRV231	3600-6120	0.500"	=	ZOB55	3600-6173	4420-9201
M3S20	12.7mm	+	MRV232	3600-6122	0.500"	=	ZOB55	3600-6173	4420-9201
M3S20	12.7mm	+	MRV233	3600-6123	0.500"	=	ZOB55	3600-6173	4420-9201
M3S20	12.7mm	+	MRV234	3600-6124	0.500"	=	ZOC55	3600-6174	4420-9201
M3S20	12.7mm	+	MRV341	3600-6125	0.500"	=	ZOC55	3600-6174	4420-9200
M3S20	12.7mm	+	MRV342	3600-6126	0.500"	=	ZOC55	3600-6174	4420-9200
M3S20	12.7mm	+	MRV343	3600-6127	0.500"	=	ZOC55	3600-6174	4420-9200
M3S20	12.7mm	+	MRS231	3600-6130	0.250"	=	COC51	3600-9208	4420-9050
M3S20	12.7mm	+	MRS232	3600-6131	0.250"	=	COC51	3600-9208	4420-9050
M3S20	12.7mm	+	MRS341	3600-6132	0.375"	=	COC52	3600-9209	4420-9051
M3S20	12.7mm	+	MRS342	3600-6133	0.375"	=	COC52	3600-9209	4420-9051
M3S20	12.7mm	+	MRS343	3600-6134	0.375"	=	COC52	3600-9209	4420-9051
M3S20	12.7mm	+	MRB231	3600-6145	0.250"	=	COC51	3600-9213	4420-9050
M3S20	12.7mm	+	MRB341	3600-6146	0.500"	=	COC55	3600-9219	4420-9051
M3S20	12.7mm	+	MRB342	3600-6147	0.500"	=	COC55	3600-9219	4420-9051

Call Toll Free 1-800-328-2174

BRUSH LESS

STEPPER

BRUSHED DC

BCS (US Standard)

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
BCS10	0.250"	+	MRB231	3600-6145	0.250"	=	COB11	3600-9204	0910-9129
BCS10	0.250"	+	MRS231	3600-6130	0.250"	=	COB11	3600-9204	0910-9129
BCS10	0.250"	+	MRS232	3600-6131	0.250"	=	COB11	3600-9204	0910-9129
BCS10	0.250"	+	MRS341	3600-6132	0.375"	=	COC21	3600-9206	0910-9152
BCS10	0.250"	+	MRS342	3600-6133	0.375"	=	COC21	3600-9206	0910-9152
BCS10	0.250"	+	MRS343	3600-6134	0.375"	=	COC21	3600-9206	0910-9152
BCS10	0.250"	+	MRB341	3600-6146	0.500"	=	COC51	3600-9213	0910-9152
BCS10	0.250"	+	MRB342	3600-6147	0.500"	=	COC51	3600-9213	0910-9152
BCS10 (SN01)	0.250"	+	MRV231	3600-6120	0.500"	=	COC51	3600-9213	4410-9201
BCS10 (SN01)	0.250"	+	MRV231	3600-6122	0.500"	=	COC51	3600-9213	4410-9201
BCS10 (SN01)	0.250"	+	MRV231	3600-6123	0.500"	=	COC51	3600-9213	4410-9201
BCS10 (SN01)	0.250"	+	MRV231	3600-6124	0.500"	=	COC51	3600-9213	4410-9201
BCS10 (others)	0.250"	+	MRV231	3600-6120	0.500"	=	ZOA51	3600-6163	3410-9201
BCS10 (others)	0.250"	+	MRV232	3600-6122	0.500"	=	ZOA51	3600-6163	3410-9201
BCS10 (others)	0.250"	+	MRV233	3600-6123	0.500"	=	ZOA51	3600-6163	3410-9201
BCS10 (others)	0.250"	+	MRV234	3600-6124	0.500"	=	ZOA51	3600-6163	3410-9201
BCS15 (all BN02)	0.250"	+	MRV231	3600-6120	0.500"	=	ZOA51	3600-6163	3415-9201
BCS15 (all BN02)	0.250"	+	MRV232	3600-6122	0.500"	=	ZOA51	3600-6163	3415-9201
BCS15 (all BN02)	0.250"	+	MRV233	3600-6123	0.500"	=	ZOA51	3600-6163	3415-9201
BCS15 (all BN02)	0.250"	+	MRV234	3600-6124	0.500"	=	ZOA51	3600-6163	3415-9201
BCS15 (all BN02)	0.250"	+	MRV341	3600-6125	0.500"	=	ZOA51	3600-6163	3415-9200
BCS15 (all BN02)	0.250"	+	MRV342	3600-6126	0.500"	=	ZOA51	3600-6163	3415-9200
BCS15 (all BN02)	0.250"	+	MRV343	3600-6127	0.500"	=	ZOA51	3600-6163	3415-9200
BCS15 (all BN02)	0.250"	+	MRB231	3600-6145	0.250"	=	COC11	3410-9039	0915-9156
BCS15 (all BN02)	0.250"	+	MRS231	3600-6130	0.250"	=	COC11	3410-9039	0915-9156
BCS15 (all BN02)	0.250"	+	MRS232	3600-6131	0.250"	=	COC11	3410-9039	0915-9156
BCS15 (all BN02)	0.250"	+	MRS341	3600-6132	0.375"	=	COC21	3600-9206	0915-9157
BCS15 (all BN02)	0.250"	+	MRS342	3600-6133	0.375"	=	COC21	3600-9206	0915-9157
BCS15 (all BN02)	0.250"	+	MRS343	3600-6134	0.375"	=	COC21	3600-9206	0915-9157
BCS15 (all BN02)	0.250"	+	MRB341	3600-6146	0.500"	=	COC51	3600-9213	0915-9157
BCS15 (all BN02)	0.250"	+	MRB342	3600-6147	0.500"	=	COC51	3600-9213	0915-9157
BCS15 (others)	0.375"	+	MRV231	3600-6120	0.500"	=	ZOB52	3600-6164	3415-9201
BCS15 (others)	0.375"	+	MRV232	3600-6122	0.500"	=	ZOB52	3600-6164	3415-9201
BCS15 (others)	0.375"	+	MRV233	3600-6123	0.500"	=	ZOB52	3600-6164	3415-9201
BCS15 (others)	0.375"	+	MRV234	3600-6124	0.500"	=	ZOB52	3600-6164	3415-9201
BCS15 (others)	0.375"	+	MRV341	3600-6125	0.500"	=	ZOB52	3600-6164	3415-9200
BCS15 (others)	0.375"	+	MRV342	3600-6126	0.500"	=	ZOB52	3600-6164	3415-9200
BCS15 (others)	0.375"	+	MRV343	3600-6127	0.500"	=	ZOB52	3600-6164	3415-9200
BCS15 (others)	0.375"	+	MRB231	3600-6145	0.250"	=	COC21	3600-9206	0915-9156
BCS15 (others)	0.375"	+	MRS231	3600-6130	0.250"	=	COC21	3600-9206	0915-9156
BCS15 (others)	0.375"	+	MRS232	3600-6131	0.250"	=	COC21	3600-9206	0915-9156
BCS15 (others)	0.375"	+	MRS341	3600-6132	0.375"	=	COC22	3600-9207	0915-9157
BCS15 (others)	0.375"	+	MRS342	3600-6133	0.375"	=	COC22	3600-9207	0915-9157
BCS15 (others)	0.375"	+	MRS343	3600-6134	0.375"	=	COC22	3600-9207	0915-9157
BCS15 (others)	0.375"	+	MRB401	3600-6148	0.625"	=	COD62	3600-9212	3415-9204
BCS15 (others)	0.375"	+	MRB402	3600-6149	0.625"	=	COD62	3600-9212	3415-9204
BCS15 (others)	0.375"	+	MRB341	3600-6146	0.500"	=	COC52	3600-9216	0915-9157
BCS15 (others)	0.375"	+	MRB342	3600-6147	0.500"	=	COC52	3600-9216	0915-9157

BCS (US Standard) Continued

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
BCS20	0.438"	+	MRV231	3600-6120	0.500"	=	ZOB54	3600-6166	0520-9201
BCS20	0.438"	+	MRV232	3600-6122	0.500"	=	ZOB54	3600-6166	0520-9201
BCS20	0.438"	+	MRV233	3600-6123	0.500"	=	ZOB54	3600-6166	0520-9201
BCS20	0.438"	+	MRV234	3600-6124	0.500"	=	ZOC54	3600-6167	0520-9201
BCS20	0.438"	+	MRV341	3600-6125	0.500"	=	ZOC54	3600-6167	0520-9200
BCS20	0.438"	+	MRV342	3600-6126	0.500"	=	ZOC54	3600-6167	0520-9200
BCS20	0.438"	+	MRV343	3600-6127	0.500"	=	ZOC54	3600-6167	0520-9200
BCS20	0.438"	+	MRB231	3600-6145	0.250"	=	COC14	3600-9208	0920-9113
BCS20	0.438"	+	MRS231	3600-6130	0.250"	=	COC14	3600-9208	0920-9113
BCS20	0.438"	+	MRS232	3600-6131	0.250"	=	COC14	3600-9208	0920-9113
BCS20	0.438"	+	MRS341	3600-6132	0.375"	=	COC24	3600-9209	0920-9114
BCS20	0.438"	+	MRS342	3600-6133	0.375"	=	COC24	3600-9209	0920-9114
BCS20	0.438"	+	MRS343	3600-6134	0.375"	=	COC24	3600-9209	0920-9114
BCS20	0.438"	+	MRB341	3600-6146	0.500"	=	COC54	3600-9215	0920-9114
BCS20	0.438"	+	MRB342	3600-6147	0.500"	=	COC54	3600-9215	0920-9114
BCS20	0.438"	+	MRB401	3600-6148	0.625"	=	COD64	3600-9217	0520-9204
BCS20	0.438"	+	MRB402	3600-6149	0.625"	=	COD64	3600-9217	0520-9204

SLS Style (US Standard)

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
SLS10	0.250"	+	MRB231	3600-6145	0.250"	=	COB11	3600-9204	0610-9016
SLS10	0.250"	+	MRS231	3600-6130	0.250"	=	COB11	3600-9204	0610-9016
SLS10	0.250"	+	MRS232	3600-6131	0.250"	=	COB11	3600-9204	0610-9016
SLS10	0.250"	+	MRS341	3600-6132	0.375"	=	COC21	3600-9206	0610-9063
SLS10	0.250"	+	MRS342	3600-6133	0.375"	=	COC21	3600-9206	0610-9063
SLS10	0.250"	+	MRS343	3600-6134	0.375"	=	COC21	3600-9206	0610-9063
SLS10	0.250"	+	MRB341	3600-6146	0.500"	=	COC51	3600-9213	0610-9063
SLS10	0.250"	+	MRB342	3600-6147	0.500"	=	COC51	3600-9213	0610-9063
SLS10 (SN01)	0.250"	+	MRV231	3600-6120	0.500"	=	COC51	3600-9213	3410-9201
SLS10 (SN01)	0.250"	+	MRV232	3600-6122	0.500"	=	COC51	3600-9213	3410-9201
SLS10 (SN01)	0.250"	+	MRV233	3600-6122	0.500"	=	COC51	3600-9213	3410-9201
SLS10 (SN01)	0.250"	+	MRV234	3600-6124	0.500"	=	COC51	3600-9213	3410-9201
SLS10 (others)	0.250"	+	MRV231	3600-6120	0.500"	=	ZOA51	3600-6163	3410-9201
SLS10 (others)	0.250"	+	MRV232	3600-6122	0.500"	=	ZOA51	3600-6163	3410-9201
SLS10 (others)	0.250"	+	MRV233	3600-6123	0.500"	=	ZOA51	3600-6163	3410-9201
SLS10 (others)	0.250"	+	MRV234	3600-6124	0.500"	=	ZOA51	3600-6163	3410-9201

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SCREW-DRIVE COUPLERS & MOTOR MOUNT KITS

SELECTION • PARTS ORDERING INFORMATION

MCS Style (Metric)

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
MCS10	6mm	+	MRB231	3600-6145	0.250"	=	COMB11	4520-9103	0510-9101
MCS10	6mm	+	MRS231	3600-6130	0.250"	=	COMB11	4520-9103	0510-9101
MCS10	6mm	+	MRS232	3600-6131	0.250"	=	COMB11	4520-9103	0510-9101
MCS10	6mm	+	MRS341	3600-6132	0.375"	=	COMC12	4520-9106	0510-9122
MCS10	6mm	+	MRS342	3600-6133	0.375"	=	COMC12	4520-9106	0510-9122
MCS10	6mm	+	MRS343	3600-6134	0.375"	=	COMC12	4520-9106	0510-9122
MCS10	6mm	+	MRB341	3600-6146	0.500"	=	COMC51	4520-9107	0510-9122
MCS10	6mm	+	MRB342	3600-6147	0.500"	=	COMC51	4520-9107	0510-9122
MCS10 (SN25)	6mm	+	MRV231	3600-6120	0.500"	=	COMC51	4520-9107	4410-9201
MCS10 (SN25)	6mm	+	MRV232	3600-6122	0.500"	=	COMC51	4520-9107	4410-9201
MCS10 (SN25)	6mm	+	MRV233	3600-6123	0.500"	=	COMC51	4520-9107	4410-9201
MCS10 (SN25)	6mm	+	MRV234	3600-6124	0.500"	=	COMC51	4520-9107	4410-9201
MCS10 (others)	6mm	+	MRV231	3600-6120	0.500"	=	ZOMA51	3600-6181	4410-9201
MCS10 (others)	6mm	+	MRV232	3600-6122	0.500"	=	ZOMA51	3600-6181	4410-9201
MCS10 (others)	6mm	+	MRV233	3600-6123	0.500"	=	ZOMA51	3600-6181	4410-9201
MCS10 (others)	6mm	+	MRV234	3600-6124	0.500"	=	ZOMA51	3600-6181	4410-9201
MCS15	8mm	+	MRV231	3600-6120	0.500"	=	ZOMB52	3600-6182	4415-9201
MCS15	8mm	+	MRV232	3600-6122	0.500"	=	ZOMB52	3600-6182	4415-9201
MCS15	8mm	+	MRV233	3600-6123	0.500"	=	ZOMB52	3600-6182	4415-9201
MCS15	8mm	+	MRV234	3600-6124	0.500"	=	ZOMB52	3600-6182	4415-9201
MCS15	8mm	+	MRV341	3600-6125	0.500"	=	ZOMB52	3600-6182	4415-9200
MCS15	8mm	+	MRV342	3600-6126	0.500"	=	ZOMB52	3600-6182	4415-9200
MCS15	8mm	+	MRV343	3600-6127	0.500"	=	ZOMB52	3600-6182	4415-9200
MCS15	8mm	+	MRB231	3600-6145	0.250"	=	COMC21	4520-9108	0515-9188
MCS15	8mm	+	MRS231	3600-6130	0.250"	=	COMC21	4520-9108	0515-9188
MCS15	8mm	+	MRS232	3600-6131	0.250"	=	COMC21	4520-9108	0515-9188
MCS15	8mm	+	MRS341	3600-6132	0.375"	=	COMC22	4520-9111	0515-9189
MCS15	8mm	+	MRS342	3600-6133	0.375"	=	COMC22	4520-9111	0515-9189
MCS15	8mm	+	MRS343	3600-6134	0.375"	=	COMC22	4520-9111	0515-9189
MCS15	8mm	+	MRB401	3600-6148	0.625"	=	COMD61	4520-9118	4415-9204
MCS15	8mm	+	MRB402	3600-6149	0.625"	=	COMD61	4520-9118	4415-9204
MCS15	8mm	+	MRB341	3600-6146	0.500"	=	COMC52	4520-9112	0515-9189
MCS15	8mm	+	MRB342	3600-6147	0.500"	=	COMC52	4520-9112	0515-9189
MCS20	11mm	+	MRV231	3600-6120	0.500"	=	ZOMB54	3600-6183	4520-9201
MCS20	11mm	+	MRV232	3600-6122	0.500"	=	ZOMB54	3600-6183	4520-9201
MCS20	11mm	+	MRV233	3600-6123	0.500"	=	ZOMB54	3600-6183	4520-9201
MCS20	11mm	+	MRV234	3600-6124	0.500"	=	ZOMC54	3600-6184	4520-9201
MCS20	11mm	+	MRV341	3600-6125	0.500"	=	ZOMC54	3600-6184	4520-9200
MCS20	11mm	+	MRV342	3600-6126	0.500"	=	ZOMC54	3600-6184	4520-9200
MCS20	11mm	+	MRV343	3600-6127	0.500"	=	ZOMC54	3600-6184	4520-9200
MCS20	11mm	+	MRB231	3600-6145	0.250"	=	COMC14	4520-9110	0520-9060
MCS20	11mm	+	MRS231	3600-6130	0.250"	=	COMC14	4520-9110	0520-9060
MCS20	11mm	+	MRS232	3600-6131	0.250"	=	COMC14	4520-9110	0520-9060
MCS20	11mm	+	MRS341	3600-6132	0.375"	=	COMC24	4520-9114	0520-9061
MCS20	11mm	+	MRS342	3600-6133	0.375"	=	COMC24	4520-9114	0520-9061
MCS20	11mm	+	MRS343	3600-6134	0.375"	=	COMC24	4520-9114	0520-9061
MCS20	11mm	+	MRB341	3600-6146	0.500"	=	COMD54	4520-9122	0520-9061
MCS20	11mm	+	MRB342	3600-6147	0.500"	=	COMD54	4520-9122	0520-9061
MCS20	11mm	+	MRB401	3600-6148	0.625"	=	COMD64	4520-9123	4520-9204
MCS20	11mm	+	MRB402	3600-6149	0.625"	=	COMD64	4520-9123	4520-9204

MLS Style (Metric)

ACTUATOR		and	MOTOR			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model	Part #	Part #
MLS10	6mm	+	MRB231	3600-6145	0.250"	=	COMB11	4520-9103	0610-9052
MLS10	6mm	+	MRS231	3600-6130	0.250"	=	COMB11	4520-9103	0610-9052
MLS10	6mm	+	MRS232	3600-6131	0.250"	=	COMB11	4520-9103	0610-9052
MLS10	6mm	+	MRS341	3600-6132	0.375"	=	COMC12	4520-9106	0610-9064
MLS10	6mm	+	MRS342	3600-6133	0.375"	=	COMC12	4520-9106	0610-9064
MLS10	6mm	+	MRS343	3600-6134	0.375"	=	COMC12	4520-9106	0610-9064
MLS10	6mm	+	MRB341	3600-6146	0.500"	=	COMC51	4520-9107	0610-9064
MLS10	6mm	+	MRB342	3600-6147	0.500"	=	COMC51	4520-9107	0610-9064
MLS10 (SN25)	6mm	+	MRV231	3600-6120	0.500"	=	COMC51	4520-9107	4410-9201
MLS10 (SN25)	6mm	+	MRV232	3600-6122	0.500"	=	COMC51	4520-9107	4410-9201
MLS10 (SN25)	6mm	+	MRV233	3600-6123	0.500"	=	COMC51	4520-9107	4410-9201
MLS10 (SN25)	6mm	+	MRV234	3600-6124	0.500"	=	COMC51	4520-9107	4410-9201
MLS10 (others)	6mm	+	MRV231	3600-6120	0.500"	=	ZOMA51	3600-6181	4410-9201
MLS10 (others)	6mm	+	MRV232	3600-6122	0.500"	=	ZOMA51	3600-6181	4410-9201
MLS10 (others)	6mm	+	MRV233	3600-6123	0.500"	=	ZOMA51	3600-6181	4410-9201
MLS10 (others)	6mm	+	MRV234	3600-6124	0.500"	=	ZOMA51	3600-6181	4410-9201

Call Toll Free
1-800-328-2174

SCREW-DRIVE GEARHEAD MOUNTING

SELECTION • DIMENSIONS • ORDERING INFORMATION

For those applications requiring reduction for inertia matching or higher torque at lower speeds, Tol-O-Matic offers high efficiency, single stage, true planetary gearheads. Two ratios are available as ideal reduction solutions with most Tol-O-Matic Nema 23 and 34 face motors and actuators.

Specifications

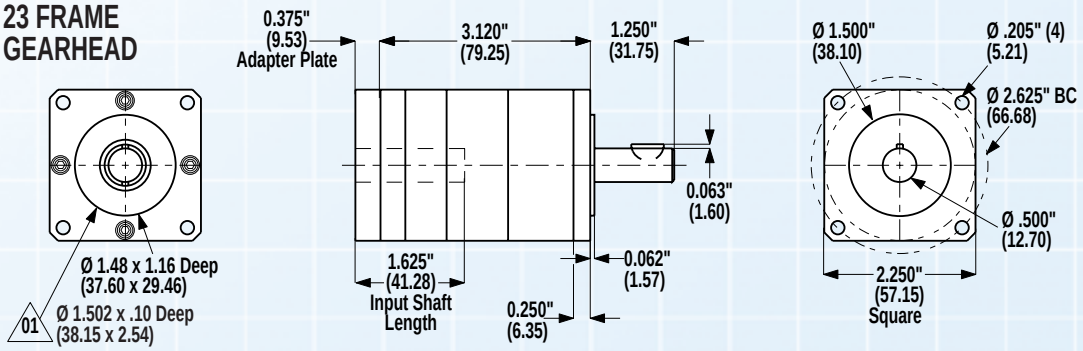
Efficiency: 85%
Backlash: less than 10 arc minutes
Max. Input Speed: 4000 RPM

Config. Number	Part Number	Frame Size	Gear Ratio	Reflected Inertia*		Input Shaft Dia.	Weight	
				oz-in²	N-m		Lbs.	Kgs.
GHK20	3600-6150	23	5.5 : 1	.34	.0024	.250"	1.78	0.81
GHJ20	3600-6151	23	5.5 : 1	.34	.0024	.500"	2.00	0.91
GHJ21	3600-6152	23	10 : 1	.29	.0020	.500"	1.98	0.90
GHK30	3600-6153	34	5.5 : 1	1.81	.0128	.375"	4.68	2.12
GHJ30	3600-6154	34	5.5 : 1	1.81	.0128	.500"	4.60	2.09
GHJ31	3600-6155	34	10 : 1	1.42	.0100	.500"	4.78	2.17

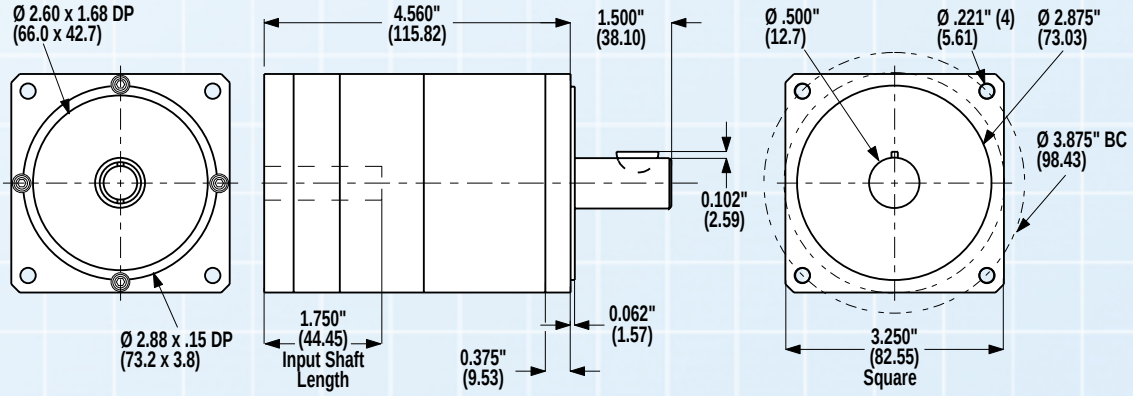
*** Reflected Inertia is inertia at motor side of gearhead.**

GEARHEAD DIMENSIONS

23 FRAME GEARHEAD



34 FRAME GEARHEAD



BRUSH LESS

STEPPER

BRUSHED DC

B3S Style (US Standard)

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
B3S10 (SN01)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20, GHJ21	3600-6151, 3600-6152	0.500"	=	COC51	3600-9213	3410-9203
B3S10 (SN01)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20, GHJ21	3600-6151, 3600-6152	0.500"	=	COC51	3600-9213	3410-9203
B3S10 (SN01)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20, GHJ21	3600-6151, 3600-6152	0.500"	=	COC51	3600-9213	3410-9203
B3S10 (SN01)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20, GHJ21	3600-6151, 3600-6152	0.500"	=	COC51	3600-9213	3410-9203
B3S10 (others)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
B3S10 (others)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
B3S10 (others)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
B3S10 (others)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
B3S10	0.250"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC51	3600-9213	3410-9203
B3S10	0.250"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
B3S10	0.250"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
B3S10	0.250"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
B3S10	0.250"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3410-9200
B3S10	0.250"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3410-9200
B3S15 (all BN02)	0.315"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC53	3415-9043	3415-9203
B3S15 (all BN02)	0.315"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COC53	3415-9043	3415-9200
B3S15 (all BN02)	0.315"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COC53	3415-9043	3415-9200
B3S15 (all BN02)	0.315"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COC53	3415-9043	3415-9200
B3S15 (all BN02)	0.315"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC53	3415-9043	3415-9200
B3S15 (all BN02)	0.315"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC53	3415-9043	3415-9200
B3S15 (all BN02)	0.315"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA53	3600-6169	3415-9203
B3S15 (all BN02)	0.315"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA53	3600-6169	3415-9203
B3S15 (all BN02)	0.315"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA53	3600-6169	3415-9203
B3S15 (all BN02)	0.315"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA53	3600-6169	3415-9203
B3S15 (all BN02)	0.315"	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOA53	3600-6169	3415-9200
B3S15 (all BN02)	0.315"	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOA53	3600-6169	3415-9200
B3S15 (all BN02)	0.315"	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOA53	3600-6169	3415-9200
B3S15 (others)	0.394"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC59	3415-9044	3415-9203
B3S15 (others)	0.394"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COD59	3415-9048	3415-9200
B3S15 (others)	0.394"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COD59	3415-9048	3415-9200
B3S15 (others)	0.394"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COD59	3415-9048	3415-9200
B3S15 (others)	0.394"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD59	3415-9048	3415-9200
B3S15 (others)	0.394"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD59	3415-9048	3415-9200
B3S15 (others)	0.394"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	3415-9203
B3S15 (others)	0.394"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	3415-9203
B3S15 (others)	0.394"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	3415-9203
B3S15 (others)	0.394"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOC59	3600-6171	3415-9203
B3S15 (others)	0.394"	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC59	3600-6171	3415-9200
B3S15 (others)	0.394"	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC59	3600-6171	3415-9200
B3S15 (others)	0.394"	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC59	3600-6171	3415-9200
B3S20	0.500"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB55	3600-6173	3420-9203
B3S20	0.500"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB55	3600-6173	3420-9203
B3S20	0.500"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB55	3600-6173	3420-9203
B3S20	0.500"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOC55	3600-6174	3420-9203
B3S20	0.500"	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC55	3600-6174	3420-9200
B3S20	0.500"	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC55	3600-6174	3420-9200
B3S20	0.500"	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC55	3600-6174	3420-9200
B3S20	0.500"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COD55	3420-9041	3420-9200
B3S20	0.500"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COD55	3420-9041	3420-9200
B3S20	0.500"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COD55	3420-9041	3420-9200
B3S20	0.500"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COD55	3420-9041	3420-9203
B3S20	0.500"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD55	3420-9041	3420-9200
B3S20	0.500"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD55	3420-9041	3420-9200

M3S Style (Metric)

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
M3S10 (SN25)	6.35mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	4410-9203
M3S10 (SN25)	6.35mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	4410-9203
M3S10 (SN25)	6.35mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	4410-9203
M3S10 (SN25)	6.35mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	4410-9203
M3S10 (others)	6.35mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	4410-9203
M3S10 (others)	6.35mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	4410-9203
M3S10 (others)	6.35mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	4410-9203
M3S10 (others)	6.35mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	4410-9203
M3S10	6.35mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC51	3600-9213	4410-9203
M3S10	6.35mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	4410-9200
M3S10	6.35mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	4410-9200
M3S10	6.35mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	4410-9200
M3S10	6.35mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	4410-9200
M3S10	6.35mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	4410-9200
M3S15 (SN12)	8mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COMC52	4520-9112	4415-9203
M3S15 (SN12)	8mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COMD52	4520-9117	4415-9200
M3S15 (SN12)	8mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COMD52	4520-9117	4415-9200
M3S15 (SN12)	8mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COMD52	4520-9117	4415-9200
M3S15 (SN12)	8mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD52	4520-9117	4415-9200
M3S15 (SN12)	8mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD52	4520-9117	4415-9200
M3S15 (SN12)	8mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
M3S15 (SN12)	8mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
M3S15 (SN12)	8mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
M3S15 (SN12)	8mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
M3S15 (SN12)	8mm	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMB52	3600-6182	4415-9200
M3S15 (SN12)	8mm	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMB52	3600-6182	4415-9200
M3S15 (SN12)	8mm	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMB52	3600-6182	4415-9200
M3S15 (others)	10mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COMC53	4520-9115	4415-9203
M3S15 (others)	10mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COMD53	4520-9120	4415-9200
M3S15 (others)	10mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COMD53	4520-9120	4415-9200
M3S15 (others)	10mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COMD53	4520-9120	4415-9200
M3S15 (others)	10mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD53	4520-9120	4415-9200
M3S15 (others)	10mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD53	4520-9120	4415-9200
M3S15 (others)	10mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	4415-9203
M3S15 (others)	10mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	4415-9203
M3S15 (others)	10mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	4415-9203
M3S15 (others)	10mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB59	3600-6170	4415-9203
M3S15 (others)	10mm	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOB59	3600-6170	4415-9200
M3S15 (others)	10mm	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOB59	3600-6170	4415-9200
M3S15 (others)	10mm	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOB59	3600-6170	4415-9200
M3S20	12.7mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB55	3600-6173	4420-9203
M3S20	12.7mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB55	3600-6173	4420-9203
M3S20	12.7mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB55	3600-6173	4420-9203
M3S20	12.7mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOC55	3600-6174	4420-9203
M3S20	12.7mm	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC55	3600-6174	4420-9200
M3S20	12.7mm	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC55	3600-6174	4420-9200
M3S20	12.7mm	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC55	3600-6174	4420-9200
M3S20	12.7mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COD55	3420-9041	4420-9200

SCREW-DRIVE GEARHEAD MOUNTING

PARTS ORDERING INFORMATION

M3S Style (Metric) continued

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
M3S20	12.7mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COD55	3420-9041	4420-9200
M3S20	12.7mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COD55	3420-9041	4420-9200
M3S20	12.7mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COD55	3420-9041	4420-9203
M3S20	12.7mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD55	3420-9041	4420-9200
M3S20	12.7mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD55	3420-9041	4420-9200

SLS Style (US Standard)

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
SLS10	0.250"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC51	3600-9213	3410-9203
SLS10	0.250"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
SLS10	0.250"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
SLS10	0.250"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
SLS10	0.250"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3410-9200
SLS10	0.250"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3410-9200
SLS10 (SN01)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
SLS10 (SN01)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
SLS10 (SN01)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
SLS10 (SN01)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
SLS10 (others)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
SLS10 (others)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
SLS10 (others)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
SLS10 (others)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203

MLS Style (Metric)

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
MLS10	6mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COMC51	4520-9107	4410-9203
MLS10	6mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COMC51	4520-9107	4410-9200
MLS10	6mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COMC51	4520-9107	4410-9200
MLS10	6mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COMC51	4520-9107	4410-9200
MLS10	6mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMC51	4520-9107	4410-9200
MLS10	6mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMC51	4520-9107	4410-9200
MLS10 (SN25)	6mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MLS10 (SN25)	6mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MLS10 (SN25)	6mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MLS10 (SN25)	6mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MLS10 (others)	6mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MLS10 (others)	6mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MLS10 (others)	6mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MLS10 (others)	6mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203

BCS Style (US Standard)

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
BCS10	0.250"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC51	3600-9213	3410-9203
BCS10	0.250"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
BCS10	0.250"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
BCS10	0.250"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3410-9200
BCS10	0.250"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3410-9200
BCS10	0.250"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3410-9200
BCS10 (SN01)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
BCS10 (SN01)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
BCS10 (SN01)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
BCS10 (SN01)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COC51	3600-9213	3410-9203
BCS10 (others)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
BCS10 (others)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
BCS10 (others)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
BCS10 (others)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3410-9203
BCS15 (all BN02)	0.250"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3415-9203
BCS15 (all BN02)	0.250"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3415-9203
BCS15 (all BN02)	0.250"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3415-9203
BCS15 (all BN02)	0.250"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOA51	3600-6163	3415-9203
BCS15 (all BN02)	0.250"	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOA51	3600-6163	3415-9200
BCS15 (all BN02)	0.250"	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOA51	3600-6163	3415-9200
BCS15 (all BN02)	0.250"	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOA51	3600-6163	3415-9200
BCS15 (all BN02)	0.250"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC51	3600-9213	3415-9203
BCS15 (all BN02)	0.250"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3415-9200
BCS15 (all BN02)	0.250"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3415-9200
BCS15 (all BN02)	0.250"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COC51	3600-9213	3415-9200
BCS15 (all BN02)	0.250"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3415-9200
BCS15 (all BN02)	0.250"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COC51	3600-9213	3415-9200
BCS15 (others)	0.375"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	36006151,36006152	0.500"	=	ZOB52	3600-6164	3415-9203
BCS15 (others)	0.375"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB52	3600-6164	3415-9203
BCS15 (others)	0.375"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB52	3600-6164	3415-9203
BCS15 (others)	0.375"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB52	3600-6164	3415-9203
BCS15 (others)	0.375"	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOB52	3600-6164	3415-9200
BCS15 (others)	0.375"	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOB52	3600-6164	3415-9200
BCS15 (others)	0.375"	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOB52	3600-6164	3415-9200
BCS15 (others)	0.375"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COD52	3600-9165	3415-9203
BCS15 (others)	0.375"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COD52	3600-9165	3415-9200
BCS15 (others)	0.375"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COD52	3600-9165	3415-9200
BCS15 (others)	0.375"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COD52	3600-9165	3415-9200
BCS15 (others)	0.375"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD52	3600-9165	3415-9200
BCS15 (others)	0.375"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD52	3600-9165	3415-9200
BCS20	0.438"	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB54	3600-6166	05209203
BCS20	0.438"	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB54	3600-6166	05209203
BCS20	0.438"	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOB54	3600-6166	05209203
BCS20	0.438"	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOC54	3600-6167	05209203
BCS20	0.438"	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC54	3600-6167	05209200
BCS20	0.438"	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC54	3600-6167	05209200
BCS20	0.438"	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOC54	3600-6167	05209200
BCS20	0.438"	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COC54	3600-9215	05209203
BCS20	0.438"	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COD54	3600-9164	05209200

BRUSH LESS

STEPPER

BRUSHED DC

BCS Style (US Standard) continued

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
BCS20	0.438"	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COD54	3600-9164	05209200
BCS20	0.438"	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COD54	3600-9164	05209200
BCS20	0.438"	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD54	3600-9164	05209200
BCS20	0.438"	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COD54	3600-9164	05209200

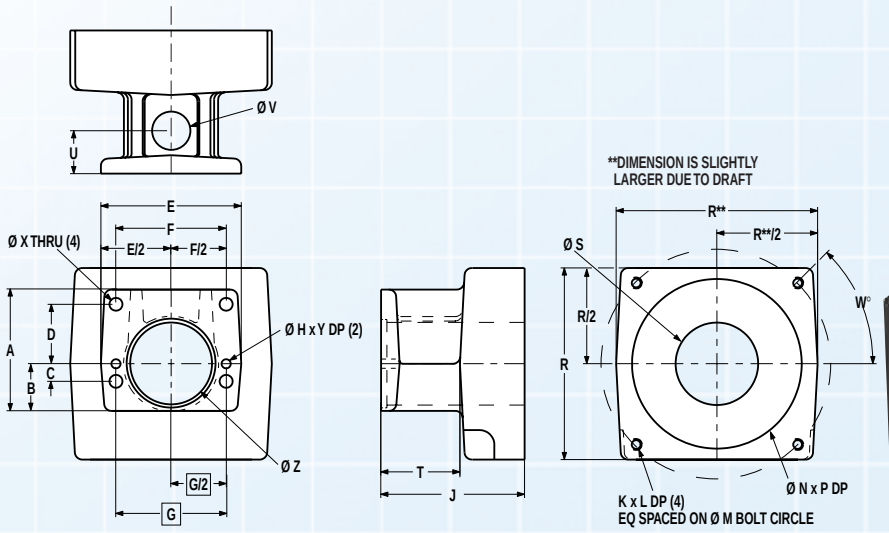
MCS Style (Metric)

ACTUATOR		and	MOTOR			and	GEARHEAD			use	COUPLER		MOUNT KIT
Series	Shaft		Model	Part #	Shaft		Model(s)	Part #(s)	Shaft		Model	Part #	Part #
MCS10	6mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COMC51	4520-9107	4410-9203
MCS10	6mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COMC51	4520-9107	4410-9200
MCS10	6mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COMC51	4520-9107	4410-9200
MCS10	6mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COMC51	4520-9107	4410-9200
MCS10	6mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMC51	4520-9107	4410-9200
MCS10	6mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMC51	4520-9107	4410-9200
MCS10 (SN25)	6mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MCS10 (SN25)	6mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MCS10 (SN25)	6mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MCS10 (SN25)	6mm	+	MRV235	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	COMC51	4520-9107	4410-9203
MCS10 (others)	6mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MCS10 (others)	6mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MCS10 (others)	6mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MCS10 (others)	6mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMA51	3600-6181	4410-9203
MCS15	8mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
MCS15	8mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
MCS15	8mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
MCS15	8mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB52	3600-6182	4415-9203
MCS15	8mm	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMB52	3600-6182	4415-9200
MCS15	8mm	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMB52	3600-6182	4415-9200
MCS15	8mm	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMB52	3600-6182	4415-9200
MCS15	8mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COMC52	4520-9112	4415-9203
MCS15	8mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COMD52	4520-9117	4415-9200
MCS15	8mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COMD52	4520-9117	4415-9200
MCS15	8mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COMD52	4520-9117	4415-9200
MCS15	8mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD52	4520-9117	4415-9200
MCS15	8mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD52	4520-9117	4415-9200
MCS20	11mm	+	MRV231	3600-6120	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB54	3600-6183	4520-9203
MCS20	11mm	+	MRV232	3600-6122	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB54	3600-6183	4520-9203
MCS20	11mm	+	MRV233	3600-6123	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMB54	3600-6183	4520-9203
MCS20	11mm	+	MRV234	3600-6124	0.500"	+	GHJ20,GHJ21	3600-6151,3600-6152	0.500"	=	ZOMC54	3600-6184	4520-9203
MCS20	11mm	+	MRV341	3600-6125	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMC54	3600-6184	4520-9200
MCS20	11mm	+	MRV342	3600-6126	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMC54	3600-6184	4520-9200
MCS20	11mm	+	MRV343	3600-6127	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	ZOMC54	3600-6184	4520-9200
MCS20	11mm	+	MRB231	3600-6145	0.250"	+	GHK20	3600-6150	0.500"	=	COMC54	3600-9215	4520-9203
MCS20	11mm	+	MRS341	3600-6132	0.375"	+	GHK30	3600-6153	0.500"	=	COMD54	4520-9122	4520-9200
MCS20	11mm	+	MRS342	3600-6133	0.375"	+	GHK30	3600-6153	0.500"	=	COMD54	4520-9122	4520-9200
MCS20	11mm	+	MRS343	3600-6134	0.375"	+	GHK30	3600-6153	0.500"	=	COMD54	4520-9122	4520-9200
MCS20	11mm	+	MRB341	3600-6146	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD54	4520-9122	4520-9200
MCS20	11mm	+	MRB342	3600-6147	0.500"	+	GHJ30,GHJ31	3600-6154,3600-6155	0.500"	=	COMD54	4520-9122	4520-9200

SCREW-DRIVE IN-LINE MOTOR/GEARHEAD COMBINATION MOUNTS

DIMENSIONS

MOTOR/GEARHEAD MOUNT 10 SERIES, B3S, M3S, BCS, MCS



These one-piece mounts are for use with the MRV brushless servo motors, or with gearheads combined with the indicated MRS or MRB motors.

NOTE: kits corresponding to MRS and MRB motors in the following table are only for motors attached to the same frame size gearhead.

KIT #	SERIES	MOTOR/GEARHEAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T
3410-9200	10	MRS 34x, MRB 34x	2.06	0.80	0.298	1.010	2.380	1.870	1.870	0.156	2.24	#10-24	0.75	3.875	2.879	0.15	3.25	1.40	1.340
3410-9201	10	MRV 23x	2.06	0.80	0.298	1.010	2.380	1.870	1.870	0.156	2.49	#10-24	0.75	2.625	1.504	0.15	2.80	1.40	1.340
3410-9202	10	MRS 23x, MRB 23x	2.06	0.80	0.298	1.010	2.380	1.870	1.870	0.156	1.80	#10-24	0.75	2.625	1.504	0.15	2.80	1.40	1.340
3410-9203	10	J/K 33x	2.06	0.80	0.298	1.010	2.380	1.870	1.870	0.156	2.24	#10-24	0.75	2.625	1.504	0.15	2.80	1.40	1.340

KIT #	SERIES	MOTOR/GEARHEAD	U	V	W	X	Y	Z
3410-9200	10	MRS 34x, MRB 34x	0.73	0.640	45°	0.221	0.23	1.40
3410-9201	10	MRV 23x	0.73	0.640	45°	0.221	0.23	1.40
3410-9202	10	MRS 23x, MRB 23x	0.73	0.640	45°	0.221	0.23	1.40
3410-9203	10	J/K 33x	0.73	0.640	45°	0.221	0.23	1.40

Above dimensions in inches

KIT #	SIZE	MOTOR/GEARHEAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T
4410-9200	25mm	MRS 34x, MRB 34x	52.3	20.3	7.6	25.7	60.5	47.5	47.5	4.0	56.9	M5 x .8	19.1	98.4	73.1	3.8	82.6	35.6	34.0
4410-9201	25mm	MRV 23x	52.3	20.3	7.6	25.7	60.5	47.5	47.5	4.0	63.2	M5 x .8	19.1	66.7	38.2	3.8	71.1	35.6	34.0
4410-9202	25mm	MRS 23x, MRB 23x	52.3	20.3	7.6	25.7	60.5	47.5	47.5	4.0	45.7	M5 x .8	19.1	66.7	38.2	3.8	71.1	35.6	34.0
4410-9203	25mm	J/K 33x	52.3	20.3	7.6	25.7	60.5	47.5	47.5	4.0	56.9	M5 x .8	19.1	66.7	38.2	3.8	71.1	35.6	34.0

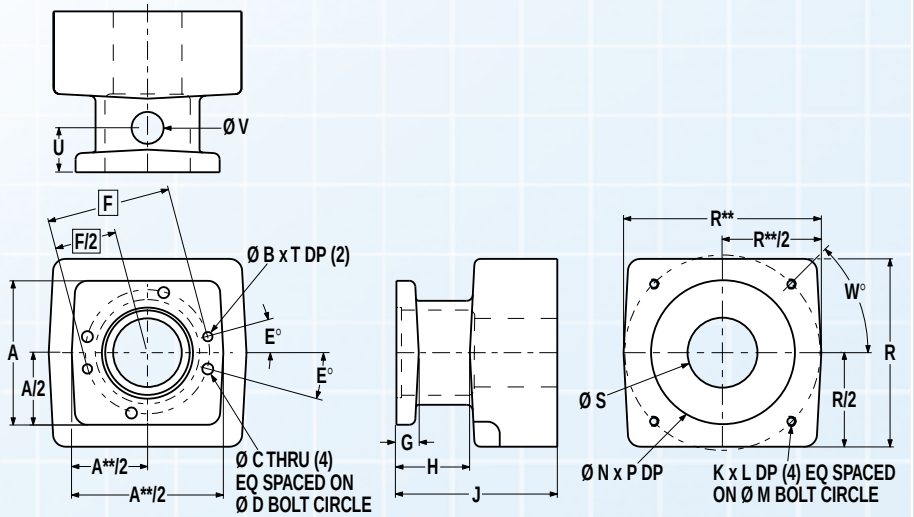
KIT #	SIZE	MOTOR/GEARHEAD	U	V	W	X	Y	Z
4410-9200	25mm	MRS 34x, MRB 34x	18.4	16.3	45°	5.6	5.8	35.6
4410-9201	25mm	MRV 23x	18.4	16.3	45°	5.6	5.8	35.6
4410-9202	25mm	MRS 23x, MRB 23x	18.4	16.3	45°	5.6	5.8	35.6
4410-9203	25mm	J/K 33x	18.4	16.3	45°	5.6	5.8	35.6

Above dimensions in millimeters

SCREW-DRIVE IN-LINE MOTOR/GEARHEAD COMBINATION MOUNTS

DIMENSIONS

MOTOR/GEARHEAD MOUNT 15 SERIES, B3S, M3S, BCS, MCS



These one-piece mounts are for use with the MRV brushless servo motors, or with gearheads combined with the indicated MRS or MRB motors.

NOTE: kits corresponding to MRS and MRB motors in the following table are only for motors attached to the same frame size gearhead.

KIT #	SERIES	MOTOR/GEARHEAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
3415-9200	15	MRS 34x, MRV 34x, MRB 34x	2.88	0.187	0.221	2.488	15°	2.488	0.45	1.47	2.38	#10-24	0.75	3.875	2.879	0.15	3.75	1.83	0.89	0.640	45°	0.23
3415-9201	15	MRV 23x	2.88	0.187	0.221	2.488	15°	2.488	0.45	1.47	2.63	#10-24	0.75	2.625	1.504	0.15	2.63	1.40	0.89	0.640	45°	0.23
3415-9202	15	MRS 23x, MRB 23x	2.88	0.187	0.221	2.488	15°	2.488	0.45	1.47	1.94	#10-24	0.75	2.625	1.504	0.15	2.63	1.40	0.89	0.640	45°	0.23
3415-9203	15	J/K 33x	2.88	0.187	0.221	2.488	15°	2.488	0.45	1.47	2.38	#10-24	0.75	2.625	1.504	0.15	2.63	1.40	0.89	0.640	45°	0.23
3415-9204	15	MRB 40x	2.88	0.187	0.221	2.488	15°	2.488	0.45	1.47	3.16	#10-24	0.75	4.596	2.879	0.15	3.75	1.63	0.89	0.640	45°	0.23

Above dimensions in inches

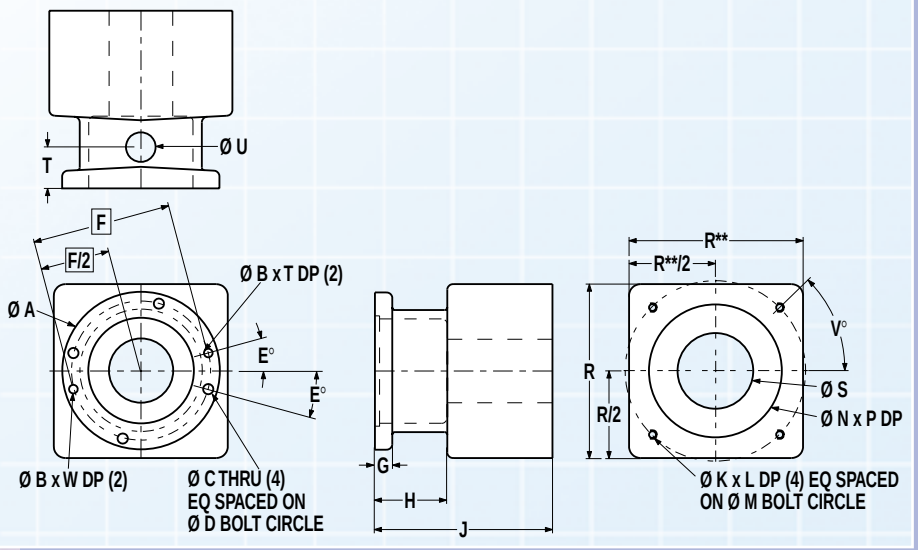
KIT #	SERIES	MOTOR/GEARHEAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
4415-9200	15	MRS 34x, MRV 34x, MRB 34x	73.2	4.7	5.6	63.2	15°	63.2	11.4	37.3	60.5	M5 x .8	19.1	98.4	73.1	3.8	95.3	41.4	22.6	16.3	45°	5.8
4415-9201	15	MRV 23x	73.2	4.7	5.6	63.2	15°	63.2	11.4	37.3	66.8	M5 x .8	19.1	66.7	38.2	3.8	66.8	35.6	22.6	16.3	45°	5.8
4415-9202	15	MRS 23x, MRB 23x	73.2	4.7	5.6	63.2	15°	63.2	11.4	37.3	49.3	M5 x .8	19.1	66.7	38.2	3.8	66.8	35.6	22.6	16.3	45°	5.8
4415-9203	15	J/K 33x	73.2	4.7	5.6	63.2	15°	63.2	11.4	37.3	60.5	M5 x .8	19.1	66.7	38.2	3.8	66.8	35.6	22.6	16.3	45°	5.8
4415-9204	15	MRB 40x	73.2	4.7	5.6	63.2	15°	63.2	11.4	37.3	80.3	M5 x .8	19.1	116.7	73.1	3.8	95.3	41.4	22.6	16.3	45°	5.8

Above dimensions in millimeters

These one-piece mounts are for use with the MRV brushless servo motors, or with gearheads combined with the indicated MRS or MRB motors.

NOTE: kits corresponding to MRS and MRB motors in the following table are only for motors attached to the same frame size gearhead.

MOTOR/GEARHEAD MOUNT 20 SERIES, B3S, M3S, BCS, MCS



KIT #	SERIES	MOTOR/GEARHEAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
0520-9200	20	MRS 34x, MRV 34x, MRB 34x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	2.50	#10-24	0.75	3.875	2.879	0.15	3.75	1.83	0.89	0.640	45°	0.23
0520-9201	20	MRV 23x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	2.75	#10-24	0.75	2.625	1.504	0.15	3.00	1.40	0.89	0.640	45°	0.23
0520-9202	20	MRS 23x, MRB 23x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	2.06	#10-24	0.75	2.625	1.504	0.15	3.00	1.40	0.89	0.640	45°	0.23
0520-9203	20	J/K 33x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	2.50	#10-24	0.75	2.625	1.504	0.15	3.00	1.40	0.89	0.640	45°	0.23
0520-9203	20	MRB 40x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	3.28	#10-24	0.75	4.596	2.879	0.15	3.75	1.83	0.89	0.640	45°	0.23
3420-9200	20	MRS 34x, MRV 34x, MRB 34x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	3.05	#10-24	0.75	3.875	2.879	0.15	3.75	1.83	0.89	0.640	45°	0.23
3420-9201	20	MRV 23x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	3.30	#10-24	0.75	2.625	1.504	0.15	3.00	1.40	0.89	0.640	45°	0.23
3420-9202	20	MRS 23x, MRB 23x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	2.61	#10-24	0.75	2.625	1.504	0.15	3.00	1.40	0.89	0.640	45°	0.23
3420-9203	20	J/K 33x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	3.05	#10-24	0.75	2.625	1.504	0.15	3.00	1.40	0.89	0.640	45°	0.23
3420-9204	20	MRB 40x	3.39	0.187	0.221	3.010	15°	3.010	0.46	1.47	3.83	#10-24	0.75	4.596	2.879	0.15	3.75	1.68	0.89	0.640	45°	0.23

Above dimensions in inches

KIT #	SERIES	MOTOR/GEARHEAD	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	V	W
0520-9200	20	MRS 34x, MRV 34x, MRB 34x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	63.5	#10-24	0.75	98.4	73.1	3.81	95.2	46.4	22.6	16.2	45°	5.8
0520-9201	20	MRV 23x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	69.8	#10-24	0.75	66.6	38.2	3.81	76.2	35.5	22.6	16.2	45°	5.8
0520-9202	20	MRS 23x, MRB 23x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	52.3	#10-24	0.75	66.6	38.2	3.81	76.2	35.5	22.6	16.2	45°	5.8
0520-9203	20	J/K 33x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	63.5	#10-24	0.75	66.6	38.2	3.81	76.2	35.5	22.6	16.2	45°	5.8
0520-9203	20	MRB 40x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	83.3	#10-24	0.75	116.7	73.1	3.81	95.2	46.4	22.6	16.2	45°	5.8
3420-9200	20	MRS 34x, MRV 34x, MRB 34x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	77.4	#10-24	0.75	98.4	73.1	3.81	95.2	46.4	22.6	16.2	45°	5.8
3420-9201	20	MRV 23x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	83.8	#10-24	0.75	66.6	38.2	3.81	76.2	35.5	22.6	16.2	45°	5.8
3420-9202	20	MRS 23x, MRB 23x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	66.2	#10-24	0.75	66.6	38.2	3.81	76.2	35.5	22.6	16.2	45°	5.8
3420-9203	20	J/K 33x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	77.4	#10-24	0.75	66.6	38.2	3.81	76.2	35.5	22.6	16.2	45°	5.8
3420-9204	20	MRB 40x	86.1	4.7	5.6	76.4	15°	76.4	11.6	37.3	97.2	#10-24	0.75	116.7	73.1	3.81	95.2	42.6	22.6	16.2	45°	5.8

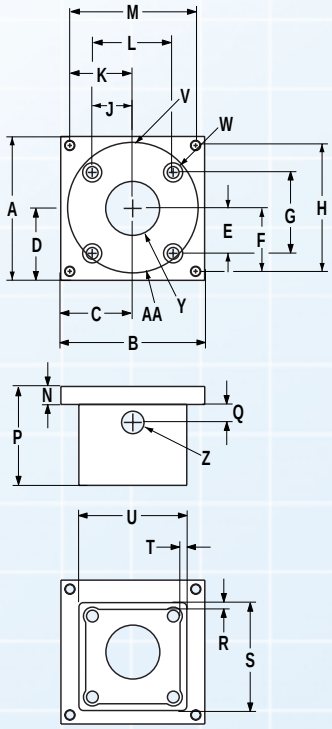
Above dimensions in millimeters

SCREW-DRIVE IN-LINE MOTOR MOUNTS

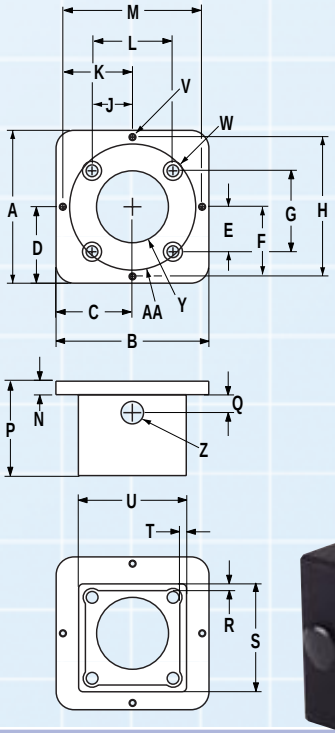
DIMENSIONS

MOTOR MOUNT BCS, MCS

TYPE A



TYPE B



NOTE: These motor mounts are for use with MRS and MRB motors only and are not to be used with gearheads.

ACTUATOR	BCS10, MCS10	BCS10, MCS10	BCS15, MCS15	BCS15, MCS15	BCS20, MCS20	BCS20, MCS20
MOTOR	MRS, MRB	MRS, MRB	MRS, MRB	MRS, MRB	MRS, MRB	MRS, MRB
NEMA	23	34	23	34	23	34
KIT #	0910-9129	0910-9152	0915-9156	0915-9157	0920-9113	0920-9114
DRAWING	Type A	Type A	Type B	Type A	Type B	Type B
A	2.220	3.270	3.000	3.270	3.250	4.250
B	2.220	3.270	3.000	3.270	3.250	4.250
C	1.110	1.635	1.500	1.635	1.625	2.125
D	1.110	1.635	1.500	1.635	1.687	2.125
E	0.550	0.550	1.032	1.032	1.250	1.250
F	0.928	1.370	1.312	1.370	1.312	1.937
G	1.100	1.100	1.812	1.812	2.250	2.250
H	1.856	2.740	2.625	2.740	2.625	3.874
J	0.550	0.550	0.906	0.906	1.125	1.125
K	0.928	1.370	1.312	1.370	1.312	1.937
L	1.100	1.100	1.812	1.812	2.250	2.250
M	1.856	2.740	2.625	2.740	2.625	3.874
N	0.375	0.500	0.750	0.500	0.875	1.000
P	1.770	2.390	2.000	2.500	2.155	2.650
Q	0.500	0.500	0.500	0.500	0.500	0.500
R	0.125	0.125	0.250	0.250	0.188	0.188
S	1.750	1.750	2.500	2.500	3.000	3.000
T	0.125	0.125	0.250	0.250	0.188	0.188
U	1.750	1.750	2.500	2.500	3.000	3.000
V	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)
W	Ø.221 THRU C'BORE ø.375 X .30 DP (4)	Ø.221 THRU C'BORE ø.375 X .34 DP (4)	Ø.281 THRU C'BORE ø.437 X .28 DP (4)	Ø.281 THRU C'BORE ø.437 X .40 DP (4)	Ø.344 THRU C'BORE ø.531 X .34 DP (4)	Ø.344 THRU C'BORE ø.531 X .42 DP (4)
X	1.506/1.503 x .070 DP	Ø2.363/2.367 X .12 DP	1.506/1.503 THRU	Ø2.363/2.367 x .12 DP	Ø1.506/1.503 X .12 DP	Ø2.363/2.367 x .12 DEEP
Y	Ø1.063 THRU	Ø1.063 THRU	—	Ø1.500 THRU	Ø1.063 THRU	Ø2.000 THRU
Z	Ø.640 THRU 1 WALL ONLY	Ø.640 THRU 1 WALL ONLY	Ø.640 THRU 1 WALL ONLY	Ø.640 THRU 1 WALL ONLY	Ø.640 THRU 1 WALL ONLY	Ø.640 THRU 1 WALL ONLY
AA	—	Ø2.878/2.882 X .080 DP	—	Ø2.878/2.882 X .080 DP	—	Ø2.878/2.882 X .080 DEEP

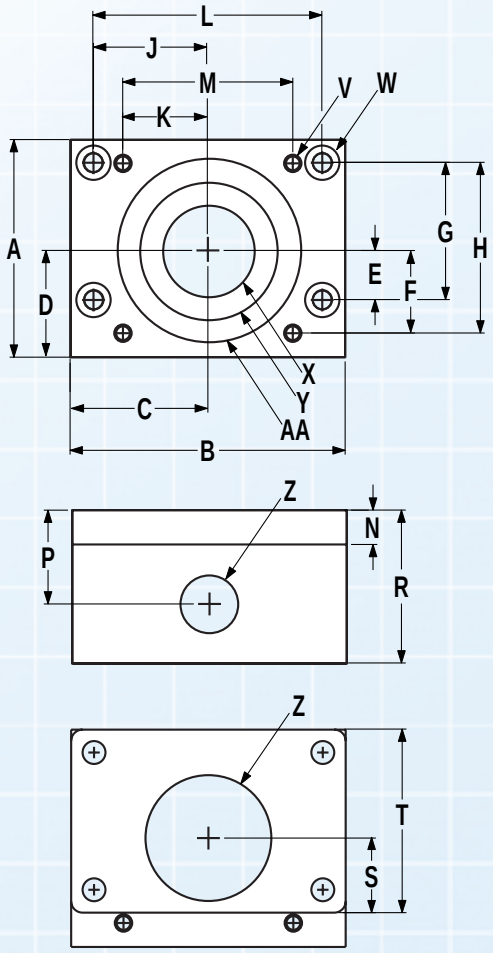
Above dimensions in inches

BRUSH LESS

STEPPER

BRUSHED DC

IN-LINE MOTOR MOUNT
SLS, MLS ACTUATOR



NOTE: These motor mounts are for use with MRS and MRB motors only and are not to be used with gearheads.

ACTUATOR	SLS10	SLS10
MOTOR	MRB	MRB
FRAME	NEMA 23	NEMA 34
KIT #	0610-9016	0610-9017
A	2.375	3.270
B	3.000	3.270
C	1.500	1.630
D	1.190	1.630
E	0.565	0.565
F	0.928	1.370
G	1.500	1.500
H	1.856	2.739
J	1.250	1.250
K	0.928	1.370
L	2.500	2.500
M	1.856	2.739
N	0.375	0.500
P	1.025	1.150
R	1.770	2.130
S	0.815	0.815
T	2.000	2.000
V	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)
W	Ø.221 THRU C'BORE Ø.375 X .22 DP (4)	Ø.221 THRU C'BORE Ø.375 X .30 DP (4)
X	Ø.750 THRU	Ø1.125 THRU
Y	Ø1.503/1.506 x .12 DP	Ø2.363/2.367 x .12 DP
Z	Ø1.375 THRU	Ø1.375 THRU
AA	–	Ø2.878/2.882 X .110 DP

ACTUATOR	MLS10	MLS10
MOTOR	MRB	MRB
FRAME	NEMA 23	NEMA 34
KIT #	0610-9052	0610-9053
A	60.33	83.06
B	76.20	83.06
C	38.10	41.40
D	30.23	41.40
E	14.35	14.35
F	23.57	34.80
G	38.10	38.10
H	47.14	69.57
J	31.75	31.75
K	23.57	34.80
L	63.50	63.50
M	47.14	69.57
N	9.53	12.70
P	26.04	29.21
R	44.96	54.10
S	20.70	20.70
T	50.80	50.80
V	10-24 UNC 2B THRU (4)	10-24 UNC 2B THRU (4)
W	Ø5.61 THRU C'BORE Ø9.53 x 5.59 DP (4)	Ø5.61 THRU C'BORE Ø9.53 x 7.62 DP (4)
X	Ø19.05 THRU	Ø28.58 THRU
Y	Ø38.18/38.25 x 3.05 DP	Ø60.02/60.12 x 3.05 DP
Z	Ø34.93 THRU	Ø34.93 THRU
AA	–	Ø73.10/73.20 X 2.79 DP

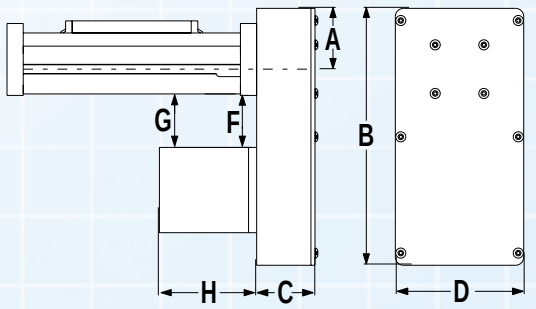
Above dimensions in inches

SCREW-DRIVE REVERSE PARALLEL MOUNTING

DIMENSIONS • SPECIFICATIONS

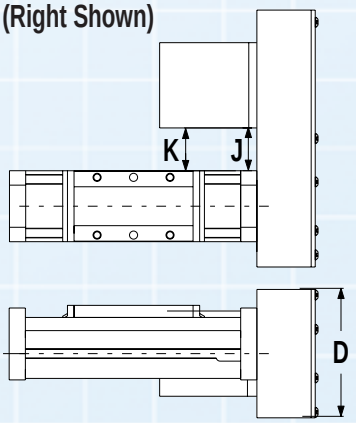
B3S (US Standard)

BOTTOM MOUNT



ACTUATOR	A	B	C	D
BCS10	1.88	7.93	1.80	3.96
BCS15	1.88	8.43	2.13	3.96
BCS20	2.71	10.25	2.50	3.96

SIDE MOUNT
(Right Shown)



SPECIFICATIONS

Reduction Inertia at Motor Shaft		
BCS10	1 : 1	0.28 oz•in²
BCS10	2 : 1	0.78 oz•in²
BCS15	1 : 1	0.28 oz•in²
BCS15	2 : 1	0.78 oz•in²
BCS20	1 : 1	0.50 oz•in²
BCS20	2 : 1	5.61 oz•in²
Reduction Efficiency		0.95

B3S10

Dimensions in inches

MOTOR	F	G	H	J	K
MRV231	1.79	1.84	4.75	1.51	1.51
MRV232	1.79	1.84	5.75	1.51	1.51
MRV233	1.79	1.84	6.75	1.51	1.51
MRV234	1.79	1.84	7.75	1.51	1.51
MRS231	1.79	1.84	2.06	1.51	1.51
MRS232	1.79	1.84	2.06	1.51	1.51
MRS341	1.23	1.28	2.58	0.94	0.94
MRS342	1.23	1.28	3.76	0.94	0.94
MRS343	1.23	1.28	3.76	0.94	0.94
MRB231	1.79	1.84	5.51	1.51	1.51
MRB231N	1.79	1.84	5.51	1.51	1.51
MRB341	1.29	1.34	5.80	1.00	1.00
MRB341N	1.29	1.34	5.80	1.00	1.00
MRB342	1.29	1.34	7.00	1.00	1.00
MRB342N	1.29	1.34	7.00	1.00	1.00

B3S15

Dimensions in inches

MOTOR	F	G	H	J	K
MRV231	1.74	1.74	4.75	1.61	1.67
MRV232	1.74	1.74	5.75	1.61	1.67
MRV233	1.74	1.74	6.75	1.61	1.67
MRV234	1.74	1.74	7.75	1.61	1.67
MRV341	1.09	1.09	6.11	0.96	1.02
MRV342	1.09	1.09	7.36	0.96	1.02
MRV343	1.09	1.09	8.61	0.96	1.02
MRS231	1.74	1.74	2.06	1.61	1.67
MRS232	1.74	1.74	2.06	1.61	1.67
MRS341	1.17	1.17	2.58	1.04	1.10
MRS342	1.17	1.17	3.76	1.04	1.10
MRS343	1.17	1.17	3.76	1.04	1.10
MRB231	1.17	1.17	5.51	1.04	1.10
MRB231N	1.17	1.17	5.51	1.04	1.10
MRB341	1.23	1.23	5.80	1.10	1.16
MRB341N	1.23	1.23	5.80	1.10	1.16
MRB342	1.23	1.23	7.00	1.10	1.16
MRB342N	1.23	1.23	7.00	1.10	1.16
MRB401	0.86	0.86	10.85	0.73	0.79
MRB401N	0.86	0.86	10.19	0.73	0.79
MRB402	0.86	0.86	10.85	0.73	0.79
MRB402N	0.86	0.86	10.19	0.73	0.79

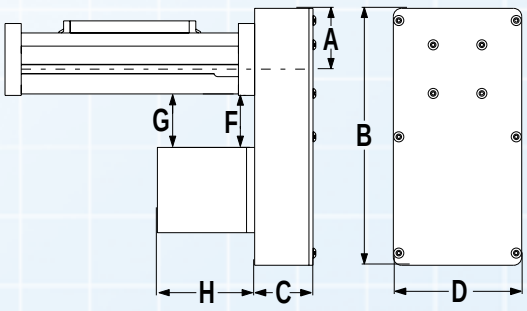
B3S20

Dimensions in inches

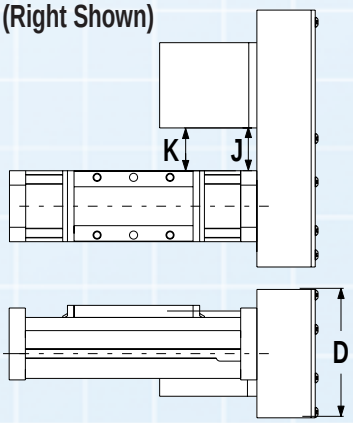
MOTOR	F	G	H	J	K
MRV341	1.70	1.70	6.11	1.35	1.51
MRV342	1.70	1.70	7.36	1.35	1.51
MRV343	1.70	1.70	8.61	1.35	1.51
MRS341	1.78	1.78	2.58	1.43	1.59
MRS342	1.78	1.78	3.76	1.43	1.59
MRS343	1.78	1.78	3.76	1.43	1.59
MRB341	1.84	1.84	5.80	1.50	1.66
MRB341N	1.84	1.84	5.80	1.50	1.66
MRB342	1.84	1.84	7.00	1.50	1.66
MRB342N	1.84	1.84	7.00	1.50	1.66
MRB401	1.47	1.47	10.85	1.13	1.29
MRB401N	1.47	1.47	10.19	1.13	1.29
MRB402	1.47	1.47	10.85	1.13	1.29
MRB402N	1.47	1.47	10.19	1.13	1.29

M3S Style (Metric)

BOTTOM MOUNT



SIDE MOUNT
(Right Shown)



ACTUATOR	A	B	C	D
M3S10	47.8	214.1	54.1	100.6
M3S15	47.8	201.4	45.7	100.6
M3S20	68.8	260.4	63.5	100.6

SPECIFICATIONS

Reduction Inertia at Motor Shaft		
MCS10	1 : 1	51.2 g•cm²
MCS10	2 : 1	143.1 g•cm²
MCS15	1 : 1	51.2 g•cm²
MCS15	2 : 1	143.1 g•cm²
MCS20	1 : 1	91.5 g•cm²
MCS20	2 : 1	1025.6 g•cm²
Reduction Efficiency		0.95

M3S10

Dimensions in millimeters

MOTOR	F	G	H	J	K
MRV231	45.6	46.9	121.0	38.5	38.5
MRV232	45.6	46.9	146.5	38.5	38.5
MRV233	45.6	46.9	172.0	38.5	38.5
MRV234	45.6	46.9	197.5	38.5	38.5
MRS231	45.6	46.9	52.5	38.5	38.5
MRS232	45.6	46.9	52.5	38.5	38.5
MRS341	31.3	32.6	65.7	24.0	24.0
MRS342	31.3	32.6	95.8	24.0	24.0
MRS343	31.3	32.6	95.8	24.0	24.0
MRB231	45.6	46.9	140.4	38.5	38.5
MRB231N	45.6	46.9	140.4	38.5	38.5
MRB341	32.9	34.1	147.8	25.5	25.5
MRB341N	32.9	34.1	147.8	25.5	25.5
MRB342	32.9	34.1	178.4	25.5	25.5
MRB342N	32.9	34.1	178.4	25.5	25.5

M3S15

Dimensions in millimeters

MOTOR	F	G	H	J	K
MRV231	44.3	44.3	121.0	41.0	42.6
MRV232	44.3	44.3	146.5	41.0	42.6
MRV233	44.3	44.3	172.0	41.0	42.6
MRV234	44.3	44.3	197.5	41.0	42.6
MRV341	27.8	27.8	155.7	24.5	26.0
MRV342	27.8	27.8	187.5	24.5	26.0
MRV343	27.8	27.8	219.4	24.5	26.0
MRS231	44.3	44.3	52.5	41.0	42.6
MRS232	44.3	44.3	52.5	41.0	42.6
MRS341	29.8	29.8	65.7	26.5	28.0
MRS342	29.8	29.8	95.8	26.5	28.0
MRS343	29.8	29.8	95.8	26.5	28.0
MRB231	29.8	29.8	140.4	26.5	28.0
MRB231N	29.8	29.8	140.4	26.5	28.0
MRB341	31.3	31.3	147.8	28.0	29.6
MRB341N	31.3	31.3	147.8	28.0	29.6
MRB342	31.3	31.3	178.4	28.0	29.6
MRB342N	31.3	31.3	178.4	28.0	29.6
MRB401	21.9	21.9	276.5	18.6	20.1
MRB401N	21.9	21.9	259.6	18.6	20.1
MRB402	21.9	21.9	276.5	18.6	20.1
MRB402N	21.9	21.9	259.6	18.6	20.1

M3S20

Dimensions in millimeters

MOTOR	F	G	H	J	K
MRV341	43.3	43.3	155.7	34.4	38.4
MRV342	43.3	43.3	187.5	34.4	38.4
MRV343	43.3	43.3	219.4	34.4	38.4
MRS341	45.4	45.4	65.7	36.4	40.4
MRS342	45.4	45.4	95.8	36.4	40.4
MRS343	45.4	45.4	95.8	36.4	40.4
MRB341	46.9	46.9	147.8	38.2	42.2
MRB341N	46.9	46.9	147.8	38.2	42.2
MRB342	46.9	46.9	178.4	38.2	42.2
MRB342N	46.9	46.9	178.4	38.2	42.2
MRB401	37.5	37.5	276.5	28.8	32.8
MRB401N	37.5	37.5	259.6	28.8	32.8
MRB402	37.5	37.5	276.5	28.8	32.8
MRB402N	37.5	37.5	259.6	28.8	32.8

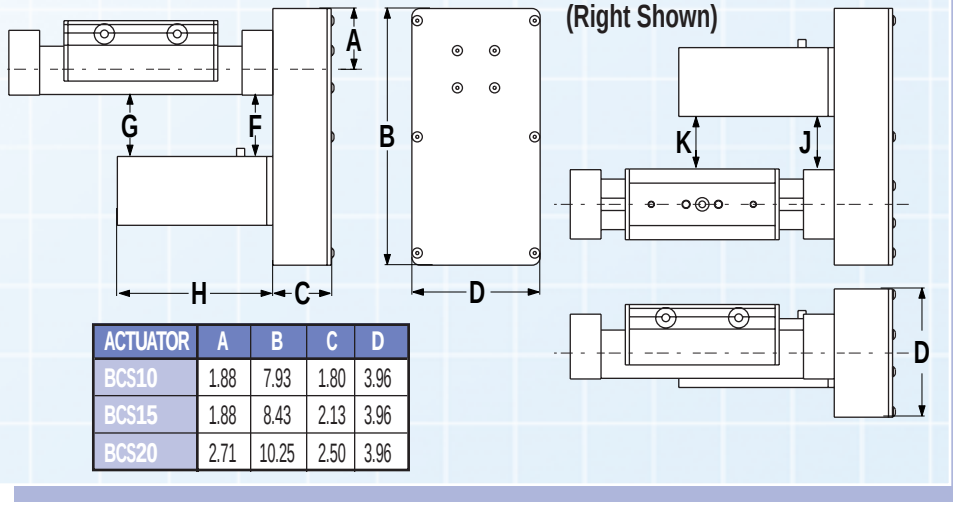
SCREW-DRIVE REVERSE PARALLEL MOUNTING

DIMENSIONS • SPECIFICATIONS

BCS (US Standard)

BOTTOM MOUNT

SIDE MOUNT (Right Shown)



ACTUATOR	A	B	C	D
BCS10	1.88	7.93	1.80	3.96
BCS15	1.88	8.43	2.13	3.96
BCS20	2.71	10.25	2.50	3.96

SPECIFICATIONS

Reduction Inertia at Motor Shaft		
BCS10	1 : 1	0.28 oz•in²
BCS10	2 : 1	0.78 oz•in²
BCS15	1 : 1	0.28 oz•in²
BCS15	2 : 1	0.78 oz•in²
BCS20	1 : 1	0.50 oz•in²
BCS20	2 : 1	5.61 oz•in²
Reduction Efficiency		0.95

BCS10

Dimensions in inches

MOTOR	F	G	H	J	K
MRV231	1.81	1.83	4.75	1.54	1.52
MRV232	1.81	1.83	5.75	1.54	1.52
MRV233	1.81	1.83	6.75	1.54	1.52
MRV234	1.81	1.83	7.75	1.54	1.52
MRS231	1.81	1.83	2.06	1.54	1.52
MRS232	1.81	1.83	2.06	1.54	1.52
MRS341	1.24	1.26	2.58	0.97	0.95
MRS342	1.24	1.26	3.76	0.97	0.95
MRS343	1.24	1.26	3.76	0.97	0.95
MRB231	1.81	1.83	5.51	1.54	1.52
MRB231N	1.81	1.83	5.51	1.54	1.52
MRB341	1.30	1.32	5.80	1.03	1.01
MRB341N	1.30	1.32	5.80	1.03	1.01
MRB342	1.30	1.32	7.00	1.03	1.01
MRB342N	1.30	1.32	7.00	1.03	1.01

BCS15

Dimensions in inches

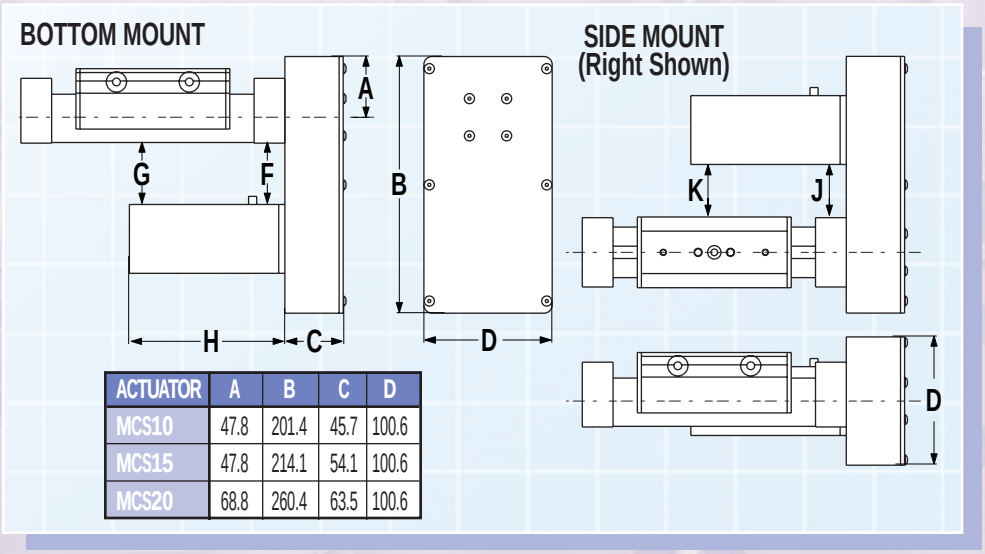
MOTOR	F	G	H	J	K
MRV231	1.70	1.86	4.75	1.67	1.36
MRV232	1.70	1.86	5.75	1.67	1.36
MRV233	1.70	1.86	6.75	1.67	1.36
MRV234	1.70	1.86	7.75	1.67	1.36
MRV341	1.05	1.21	6.11	1.02	0.71
MRV342	1.05	1.21	7.36	1.02	0.71
MRV343	1.05	1.21	8.61	1.02	0.71
MRS231	1.70	1.86	2.06	1.67	1.36
MRS232	1.70	1.86	2.06	1.67	1.36
MRS341	1.13	1.29	2.58	1.10	0.79
MRS342	1.13	1.29	3.76	1.10	0.79
MRS343	1.13	1.29	3.76	1.10	0.79
MRB231	1.70	1.86	5.51	1.67	1.36
MRB231N	1.70	1.86	5.51	1.67	1.36
MRB341	1.19	1.35	5.80	1.16	0.85
MRB341N	1.19	1.35	5.80	1.16	0.85
MRB342	1.19	1.35	7.00	1.16	0.85
MRB342N	1.19	1.35	7.00	1.16	0.85
MRB401	0.82	0.98	10.85	0.79	0.48
MRB401N	0.82	0.98	10.19	0.79	0.48
MRB402	0.82	0.98	10.85	0.79	0.48
MRB402N	0.82	0.98	10.19	0.79	0.48

BCS20

Dimensions in inches

MOTOR	F	G	H	J	K
MRV341	1.79	1.86	6.11	1.60	1.26
MRV342	1.79	1.86	7.36	1.60	1.26
MRV343	1.79	1.86	8.61	1.60	1.26
MRS341	1.87	1.94	2.58	1.68	1.34
MRS342	1.87	1.94	3.76	1.68	1.34
MRS343	1.87	1.94	3.76	1.68	1.34
MRB341	1.93	2.00	5.80	1.75	1.41
MRB341N	1.93	2.00	5.80	1.75	1.41
MRB342	1.93	2.00	7.00	1.75	1.41
MRB342N	1.93	2.00	7.00	1.75	1.41
MRB401	1.56	1.63	10.85	1.38	1.04
MRB401N	1.56	1.63	10.19	1.38	1.04
MRB402	1.56	1.63	10.85	1.38	1.04
MRB402N	1.56	1.63	10.19	1.38	1.04

MCS Style (Metric)



ACTUATOR	A	B	C	D
MCS10	47.8	201.4	45.7	100.6
MCS15	47.8	214.1	54.1	100.6
MCS20	68.8	260.4	63.5	100.6

SPECIFICATIONS

Reduction Inertia at Motor Shaft		
MCS10	1 : 1	51.2 g•cm²
MCS10	2 : 1	142.6 g•cm²
MCS15	1 : 1	51.2 g•cm²
MCS15	2 : 1	142.6 g•cm²
MCS20	1 : 1	91.5 g•cm²
MCS20	2 : 1	1026.0 g•cm²
Reduction Efficiency		0.95

BRUSH LESS

STEPPER

BRUSHED DC

MCS10

Dimensions in millimeters

MOTOR	F	G	H	J	K
MRV231	46.1	46.6	121.0	39.2	38.7
MRV232	46.1	46.6	146.5	39.2	38.7
MRV233	46.1	46.6	172.0	39.2	38.7
MRV234	46.1	46.6	197.5	39.2	38.7
MRS231	46.1	46.6	52.5	39.2	38.7
MRS232	46.1	46.6	52.5	39.2	38.7
MRS341	31.6	32.1	65.7	24.7	24.2
MRS342	31.6	32.1	95.8	24.7	24.2
MRS343	31.6	32.1	95.8	24.7	24.2
MRB231	46.1	46.6	140.4	39.2	38.7
MRB231N	46.1	46.6	140.4	39.2	38.7
MRB341	33.1	33.6	147.8	26.2	25.7
MRB341N	33.1	33.6	147.8	26.2	25.7
MRB342	33.1	33.6	178.4	26.2	25.7
MRB342N	33.1	33.6	178.4	26.2	25.7

MCS15

Dimensions in millimeters

MOTOR	F	G	H	J	K
MRV231	43.3	47.4	121.0	42.6	34.7
MRV232	43.3	47.4	146.5	42.6	34.7
MRV233	43.3	47.4	172.0	42.6	34.7
MRV234	43.3	47.4	197.5	42.6	34.7
MRV341	26.8	30.8	155.7	26.0	18.1
MRV342	26.8	30.8	187.5	26.0	18.1
MRV343	26.8	30.8	219.4	26.0	18.1
MRS231	43.3	47.4	52.5	42.6	34.7
MRS232	43.3	47.4	52.5	42.6	34.7
MRS341	28.8	32.9	65.7	28.0	20.1
MRS342	28.8	32.9	95.8	28.0	20.1
MRS343	28.8	32.9	95.8	28.0	20.1
MRB231	43.3	47.4	140.4	42.6	34.7
MRB231N	43.3	47.4	140.4	42.6	34.7
MRB341	30.3	34.4	147.8	29.6	21.7
MRB341N	30.3	34.4	147.8	29.6	21.7
MRB342	30.3	34.4	178.4	29.6	21.7
MRB342N	30.3	34.4	178.4	29.6	21.7
MRB401	20.9	25.0	276.5	20.1	12.2
MRB401N	20.9	25.0	259.6	20.1	12.2
MRB402	20.9	25.0	276.5	20.1	12.2
MRB402N	20.9	25.0	259.6	20.1	12.2

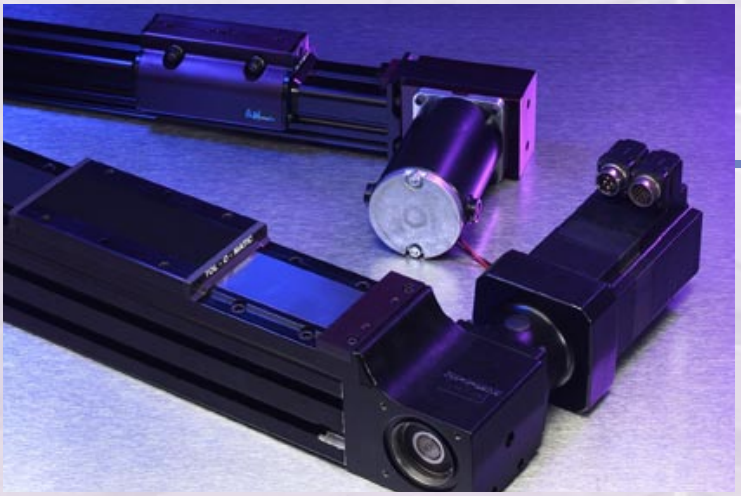
MCS20

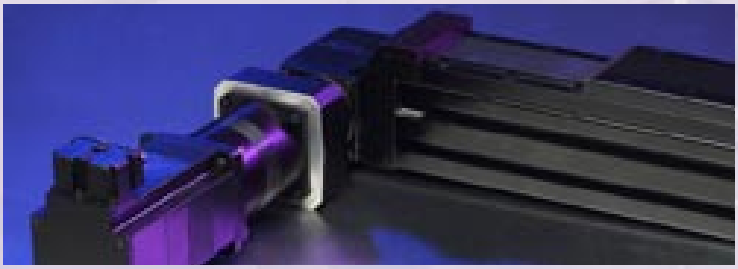
Dimensions in millimeters

MOTOR	F	G	H	J	K
MRV341	45.6	47.4	155.7	40.8	32.1
MRV342	45.6	47.4	187.5	40.8	32.1
MRV343	45.6	47.4	219.4	40.8	32.1
MRS341	47.6	49.4	65.7	42.8	34.1
MRS342	47.6	49.4	95.8	42.8	34.1
MRS343	47.6	49.4	95.8	42.8	34.1
MRB341	49.2	51.0	147.8	44.6	35.9
MRB341N	49.2	51.0	147.8	44.6	35.9
MRB342	49.2	51.0	178.4	44.6	35.9
MRB342N	49.2	51.0	178.4	44.6	35.9
MRB401	39.7	41.5	276.5	35.2	26.5
MRB401N	39.7	41.5	259.6	35.2	26.5
MRB402	39.7	41.5	276.5	35.2	26.5
MRB402N	39.7	41.5	259.6	35.2	26.5

MOTOR MOUNTING BELT-DRIVE ACTUATORS

DIMENSIONS • SPECIFICATIONS





DIRECT-DRIVE MOTOR MOUNTING

Drive motor is mounted directly to the drive end assembly. Motor may be mounted directly on the left or right side.

B3B GEARHEAD REDUCTION

Available on B3B/M3B actuators only, this mounting is used in applications requiring reduction for inertia matching or higher torque at lower speeds.

REDUCTION DRIVE MOUNTING

Motor is mounted to the reduction assembly, providing a 3:1 speed reduction from the motor to the belt-drive wheel.

BELT-DRIVE DIRECT DRIVE MOUNTING

SPECIFICATIONS

MOUNTING KITS AND COUPLERS FOR MOTORS WITH GEARHEADS

B3B (US Standard) & M3B (Metric) All Sizes

GEARHEAD		MOTORS Tol-O-Matic Configuration #	MOTOR MNTNG KIT Part #	COUPLER			
				JAW STYLE		FLEX DISC	
T-O-M Config. #	T-O-M Part #			T-O-M Part #	COUPLING	T-O-M Part #	COUPLING
GHJ20	3600-6151	MRV 231, 232, 233, 234	3410-9075	—	—	3600-6177	ZOA55
GHJ21	3600-6152	MRV 231, 232, 233, 234	3410-9075	—	—	3600-6177	ZOA55
GHJ30	3600-6154	MRV 341, 342, 343, MRB 341, 342, 341N, 342N	3410-9076	3420-9041	COD55	3600-6174	ZOD55
GHJ31	3600-6155	MRV 341, 342, 343, MRB 341, 342, 341N, 342N	3410-9076	3420-9041	COD55	3600-6174	ZOD55
GHK30	3600-6153	MRS 341, & 342	3410-9076	3600-9236	COD55	—	—
GHK20	3600-6150	MRS 231, 232, MRB 231, 231N	3410-9075	3600-9219	COD55	—	—

For Gearhead dimensional information, refer to page 109.

Config. Number	Part Number	Frame Size	Gear Ratio	Inertia		Input Shaft Dia.	Weight	
				oz-in	N-m		Lbs.	Kgs.
GHK20	3600-6150	23	5.5 : 1	.34	.0024	.250"	1.78	0.81
GHJ20	3600-6151	23	5.5 : 1	.34	.0024	.500"	2.00	0.91
GHJ21	3600-6152	23	10 : 1	.29	.0020	.500"	1.98	0.90
GHK30	3600-6153	34	5.5 : 1	1.81	.0128	.375"	4.68	2.12
GHJ30	3600-6154	34	5.5 : 1	1.81	.0128	.500"	4.60	2.09
GHJ31	3600-6155	34	10 : 1	1.42	.0100	.500"	4.78	2.17

SPECIFICATIONS

Efficiency: 85%

Backlash: less than 10 arc minutes

Max. Input Speed: 4000 RPM

MOUNTING KITS AND COUPLERS FOR MOTORS

B3B (US Standard) & M3B (Metric)

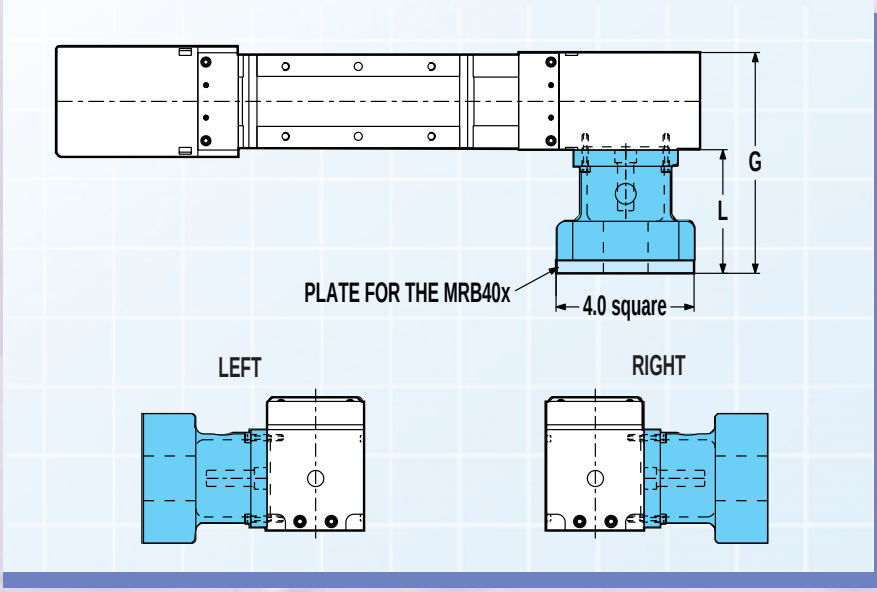
Tol-O-Matic MOTOR Config. #	Tol-O-Matic MOTOR Part #	MOTOR MNTNG KIT Part #	COUPLERS			
			JAW STYLE		FLEX DISC	
			T-O-M Part #	CODE	T-O-M Part #	CODE
MRB 401N	3600-6143	3410-9074	3600-9218	COD65	—	—
MRB 402N	3600-6144	3410-9074	3600-9218	COD65	—	—
MRB 231	3600-6145	3410-9072	3600-9219	COC55	—	—
MRB 341	3600-6146	3410-9073	3600-9219	COC55	—	—
MRB 342	3600-6147	3410-9073	3600-9219	COC55	—	—
MRB 401	3600-6148	3410-9074	3600-9218	COD65	—	—
MRB 402	3600-6149	3410-9074	3600-9218	COD65	—	—
MRS 341	3600-6132	3410-9077	3600-9216	COC52	—	—
MRS 342	3600-6133	3410-9077	3600-9216	COC52	—	—
MRS 343	3600-6134	3410-9077	3600-9216	COC52	—	—

Tol-O-Matic MOTOR Config. #	Tol-O-Matic MOTOR Part #	MOTOR MNTNG KIT Part #	COUPLERS			
			JAW STYLE		FLEX DISC	
			T-O-M Part #	CODE	T-O-M Part #	CODE
MRV 231	3600-6120	3410-9072	—	—	3600-6177	ZOA55
MRV 232	3600-6122	3410-9072	—	—	3600-6177	ZOA55
MRV 233	3600-6123	3410-9072	—	—	3600-6177	ZOA55
MRV 234	3600-6124	3410-9072	—	—	3600-6174	ZOC55
MRV 341	3600-6125	3410-9073	—	—	3600-6174	ZOC55
MRV 342	3600-6126	3410-9073	—	—	3600-6174	ZOC55
MRV 343	3600-6127	3410-9073	—	—	3600-6174	ZOC55
MRB 231N	3600-6140	3410-9072	3600-9219	COC55	—	—
MRB 341N	3600-6141	3410-9073	3600-9219	COC55	—	—
MRB 342N	3600-6142	3410-9073	3600-9219	COC55	—	—

BELT-DRIVE DIRECT-DRIVE MOUNTING

DIMENSIONS • SPECIFICATIONS

B3B (US Standard) & M3B (Metric)



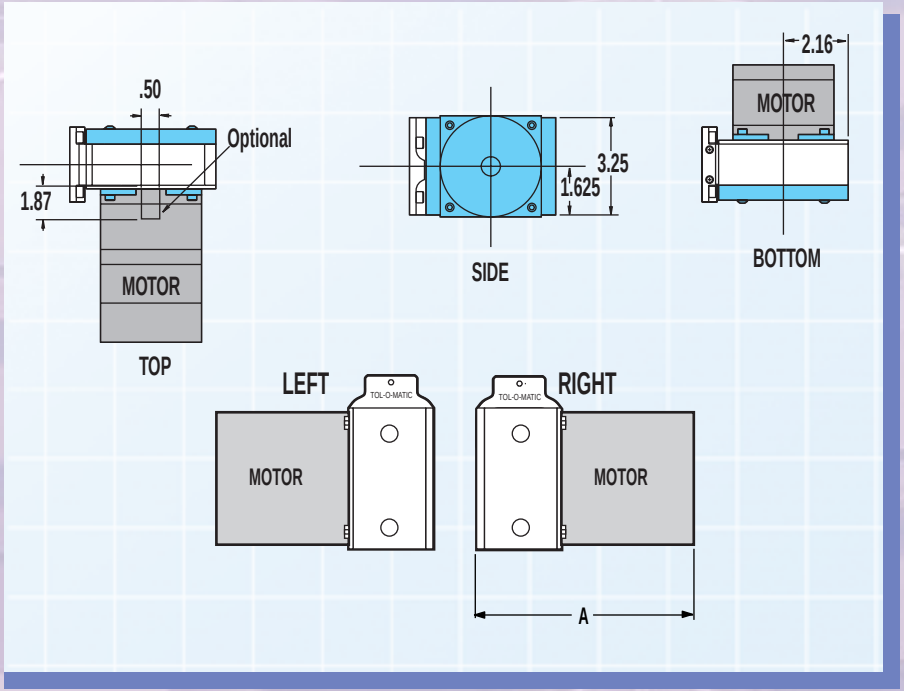
B3B Dimensions in inches

MOTOR	B3B10		B3B15		B3B20	
	L	G	L	G	L	G
MRV23_	3.81	6.00	3.81	6.81	3.56	7.50
MRV34_	3.77	5.96	3.77	6.77	3.77	7.71
MRS34_	3.56	5.75	3.56	6.56	3.56	7.50
MRB23_	3.12	5.31	3.12	6.12	3.81	7.75
MRB34_	3.77	5.96	3.77	6.77	3.77	7.71
MRB40_	4.42	6.66	4.42	7.42	4.42	8.36

M3B Dimensions in millimeters

MOTOR	M3B10		M3B15		M3B20	
	L	G	L	G	L	G
MRV23_	96.7	152.4	96.7	172.4	90.4	190.5
MRV34_	95.7	115.3	95.7	171.9	95.7	195.8
MRS34_	90.4	147.7	90.4	166.6	90.4	190.5
MRB23_	79.2	134.9	79.2	155.4	96.7	196.8
MRB34_	95.7	115.3	95.7	171.9	95.7	195.8
MRB40_	112.2	167.9	112.2	188.5	112.2	212.3

BCB (US Standard)



BCB Dimensions in inches

MOTOR	BCB15
	A
MRS341	4.58
MRS342	5.76
MRS343	7.06
MRB342	8.50
MRB342N	8.60

STUB SHAFT OPTION

A .50in dia. x 1.87 in. long stub shaft in place of the direct mounted motor is available. Motor Mounting Kits for stub shaft actuators are treated as a special.

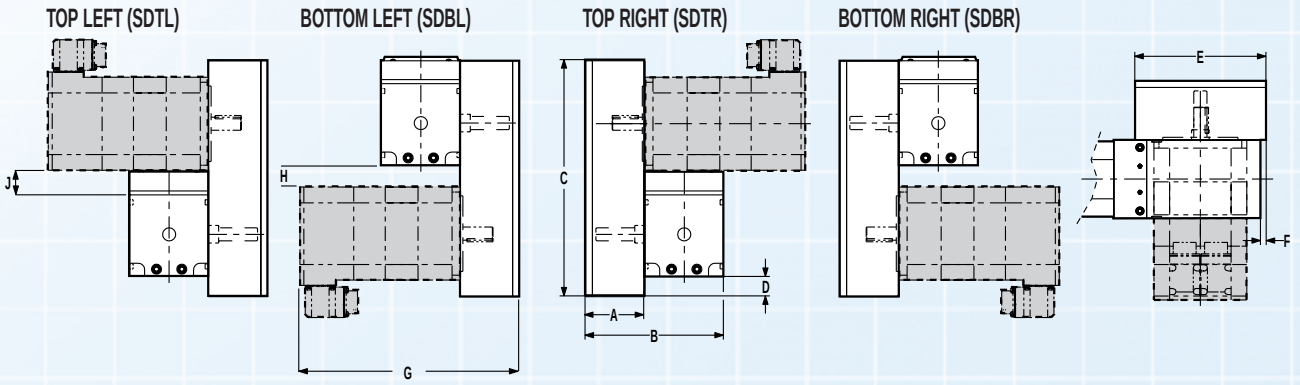
NOTE:

- All configurations are viewed from motor end of actuator with carrier up
- If customer chooses to provide motor items and/or reduction drive, these items must be provided to the factory for assembly

BELT-DRIVE REDUCTION DRIVE MOUNTING

DIMENSIONS • SPECIFICATIONS

B3B (US Standard)



ACTUATOR	A	B	C	D	E	F
B3B10	2.25	3.06	9.00	.88	5.00	.43
B3B15	2.25	5.25	9.00	.78	5.00	.206
B3B20	2.25	6.19	9.00	.63	5.00	.71

B3B10

Dimensions in inches

MOTOR	G	H	J
MRV231	6.82	1.60	1.35
MRV232	7.82	1.60	1.35
MRV233	8.82	1.60	1.35
MRV234	9.82	1.60	1.35
MRV341	8.36	1.07	.82
MRV342	9.61	1.07	.82
MRV343	10.86	1.07	.82
MRS341	4.66	1.03	.781
MRS342	5.89	1.03	.781
MRS343	5.84	1.03	.781
MRB231	8.41	1.60	1.35
MRB231N	8.28	1.60	1.35
MRB341	7.60	1.10	.85
MRB341N	7.48	1.10	.85
MRB342	8.80	1.10	.85
MRB342N	8.68	1.10	.85
MRB401	17.10	1.07	.82
MRB401N	17.54	1.07	.82
MRB402	16.21	1.07	.82
MRB402N	17.54	1.07	.82

B3B15

Dimensions in inches

MOTOR	G	H	J
MRV231	6.82	1.49	1.60
MRV232	7.82	1.49	1.60
MRV233	8.82	1.49	1.60
MRV234	9.82	1.49	1.60
MRV341	8.36	.85	.95
MRV342	9.61	.85	.95
MRV343	10.86	.85	.95
MRS341	4.66	.92	1.03
MRS342	5.84	.92	1.03
MRS343	5.84	.92	1.03
MRB231	8.41	1.50	1.60
MRB231N	8.28	1.50	1.60
MRB341	7.60	.99	1.09
MRB341N	7.48	.99	1.09
MRB342	8.80	.99	1.09
MRB342N	8.68	.99	1.09
MRB401	17.10	.61	.72
MRB401N	16.21	.61	.72
MRB402	17.54	.61	.72
MRB402N	17.54	.61	.72

B3B20

Dimensions in inches

MOTOR	G	H	J
MRV233	9.00	1.35	1.60
MRV234	10.00	1.35	1.60
MRV341	8.36	.70	.95
MRV342	9.61	.70	.95
MRV343	10.86	.70	.95
MRS342	6.01	.70	.95
MRS343	7.31	.70	.95
MRB401	16.71	.47	.72
MRB401N	15.84	.47	.72
MRB402	18.05	.47	.72
MRB402N	17.17	.47	.72

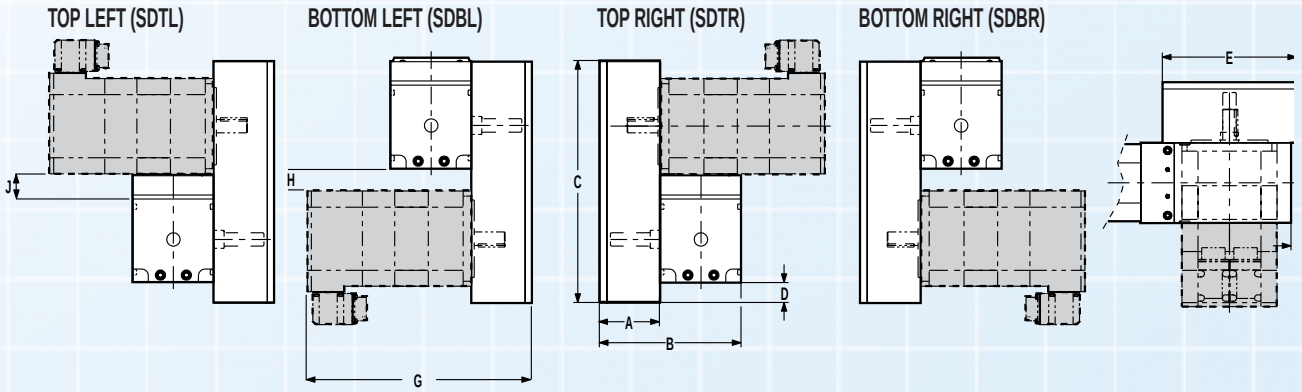
SPECIFICATIONS

Reduction Inertia at Motor Shaft			
B3B10	3:1	MRV23/34	2.77 oz-in^2
		MRV40	3.19 oz-in^2
B3B15	3:1	MRV34/40	4.85 oz-in^2
B3B20	3:1	MRV34/40	4.85 oz-in^2
Weight of Reduction Drive			
B3B10		4.4 lb	
B3B15		4.8 lb	
B3B20		4.8 lb	
Reduction Efficiency			
B3B10		0.95	
B3B15		0.95	
B3B20		0.95	

BELT-DRIVE REDUCTION DRIVE MOUNTING

DIMENSIONS • SPECIFICATIONS

M3B (Metric)



ACTUATOR	A	B	C	D	E	F
M3B10	57.15	77.7	228.6	22.3	127.0	10.9
M3B15	57.15	133.3	228.6	19.8	127.0	5.2
M3B20	57.15	157.2	228.6	16.0	127.0	18.0

M3B10 Dimensions in millimeters

MOTOR	G	H	J
MRV231	173.2	40.6	34.2
MRV232	198.6	40.6	34.2
MRV233	224.0	40.6	34.2
MRV234	249.4	40.6	34.2
MRV341	212.3	27.1	20.8
MRV342	244.0	27.1	20.8
MRV343	275.8	27.1	20.8
MRS341	118.3	26.1	19.8
MRS342	149.6	26.1	19.8
MRS343	148.3	26.1	19.8
MRB231	213.6	40.6	34.2
MRB231N	210.3	40.6	34.2
MRB341	193.0	27.9	21.5
MRB341N	189.9	27.9	21.5
MRB342	223.5	27.9	21.5
MRB342N	220.4	27.9	21.5
MRB401	434.3	27.1	20.8
MRB401N	445.5	27.1	20.8
MRB402	411.7	27.1	20.8
MRB402N	445.5	27.1	20.8

M3B15 Dimensions in millimeters

MOTOR	G	H	J
MRV231	173.2	37.8	40.6
MRV232	198.6	37.8	40.6
MRV233	224.0	37.8	40.6
MRV234	249.4	37.8	40.6
MRV341	212.3	21.5	24.1
MRV342	244.0	21.5	24.1
MRV343	275.8	21.5	24.1
MRS341	118.3	23.3	26.1
MRS342	148.3	23.3	26.1
MRS343	148.3	23.3	26.1
MRB231	213.6	38.1	40.6
MRB231N	210.3	38.1	40.6
MRB341	193.0	25.1	27.6
MRB341N	189.9	25.1	27.6
MRB342	223.5	25.1	27.6
MRB342N	220.4	25.1	27.6
MRB401	434.3	15.4	18.2
MRB401N	411.7	15.4	18.2
MRB402	445.5	15.4	18.2
MRB402N	445.5	15.4	18.2

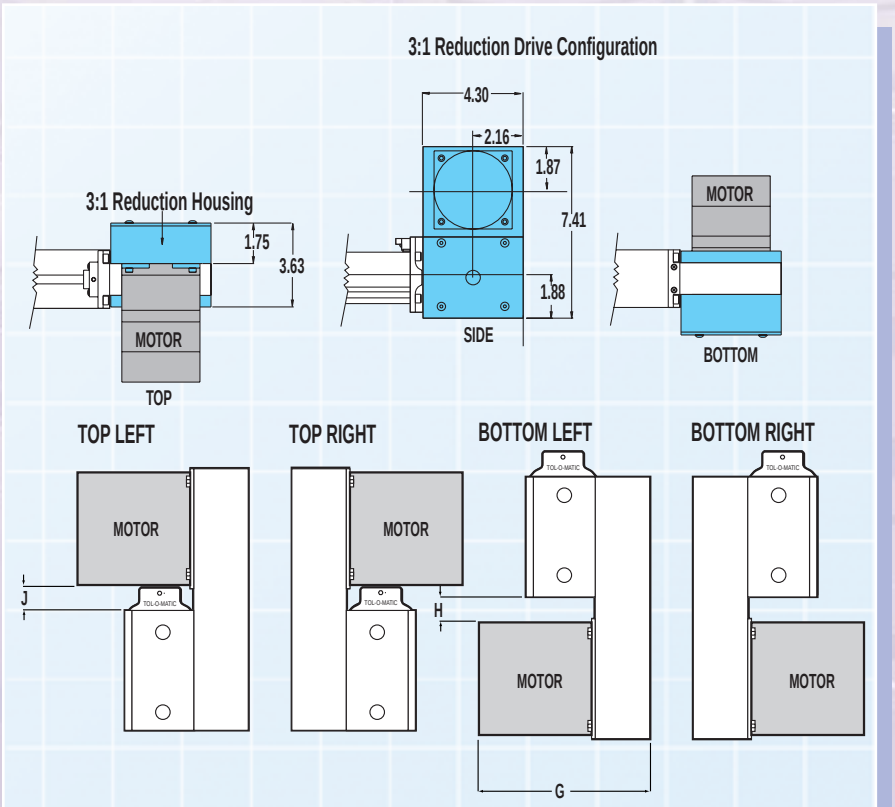
M3B20 Dimensions in millimeters

MOTOR	G	H	J
MRV233	228.6	34.3	40.6
MRV234	254.0	34.3	40.6
MRV341	212.3	17.8	24.1
MRV342	244.1	17.8	24.1
MRV343	275.8	17.8	24.1
MRS342	152.6	17.8	24.13
MRS343	185.7	17.8	24.13
MRB401	424.4	11.9	18.2
MRB401N	402.3	11.9	18.2
MRB402	458.5	11.9	18.2
MRB402N	436.1	11.9	18.2

SPECIFICATIONS

Reduction Inertia at Motor Shaft			
M3B10	3:1	MRV23/34	506.6 g-cm²
		MRV40	583.4 g-cm²
M3B15	3:1	MRV34/40	887.1 g-cm²
M3B20	3:1	MRV34/40	887.1 g-cm²
Weight of Reduction Drive			
M3B10		1995.8 g	
M3B15		2177.2 g	
M3B20		2177.2 g	
Reduction Efficiency			
M3B10		0.95	
M3B15		0.95	
M3B20		0.95	

BCB (US Standard)



NOTE: The reducer box projects below the plane of the idler and drive wheel enclosures. If the entire length of a reduction drive actuator is to be mounted on a flat plane surface, spacers will be required under the tube supports to provide clearance under the reduction drive box.

SPECIFICATIONS

Reduction Inertia at Motor Shaft		
BCB15	3:1	9.54 oz-in^2
Weight of Reduction Drive		
BCB15		3.46 lb
Reduction Efficiency		
BCB15		0.95

BCB15

Dimensions in inches

MOTOR	G	H	J
MRS341	4.34	.34	.34
MRS342	5.52	.34	.34
MRS343	6.82	.34	.34
MRB342	8.26	.40	.40
MRB342N	8.26	.40	.40

BRUSH LESS

STEPPER

BRUSHED DC

Call Toll Free
1-800-328-2174

PIT PANEL MOUNT USER INTERFACE

SPECIFICATIONS • DIMENSIONS

User interaction with the MSS, MSCLDC, or the MSC is simple with the PIT panel mount user interface. The Tol-O-Motion MS software allows visual setup of the panel to status the user on a particular action taking place, or to prompt the user to make a decision or provide information such as move distance, move speed, repeat count.

Features

- ***Flush or surface mounting***
- ***Four line by 20 character LCD display***
- ***RS232 communication*** to MSC, MSCLDC, or MSS controllers
- ***Uses RS232 cable supplied*** with MSC, MSCLDC, or MSS controllers

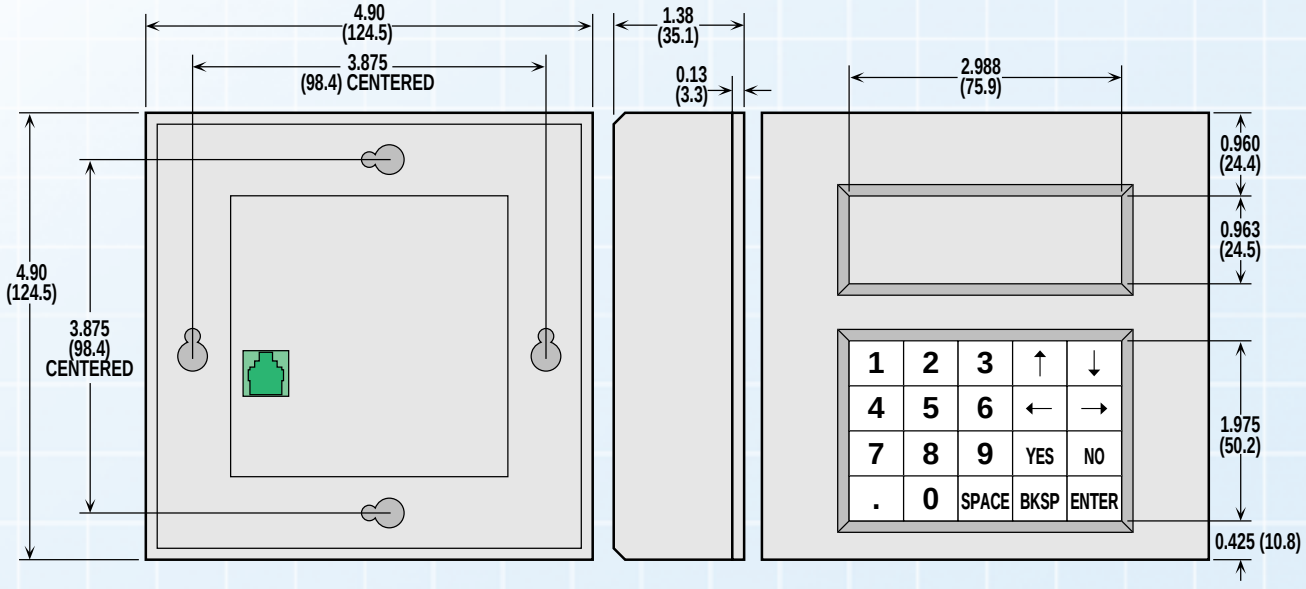
Cables

Motor cable and encoder cable are included when ordering MSC, MSCLDC, or MSS controllers (see page 127)

Ordering Information

Configuration Code	Tol-O-Matic Part #
PIT	3600-9607

PIT



JS JOYSTICK

SPECIFICATIONS • DIMENSIONS

For simple setup of the SSC controller the JS joystick provides 2-axis manipulation. Used with the Joystick Teach mode of the Tol-O-Motion SSC software, moves can be made with velocity control, and then stored using a separate button integrated into the joystick housing.

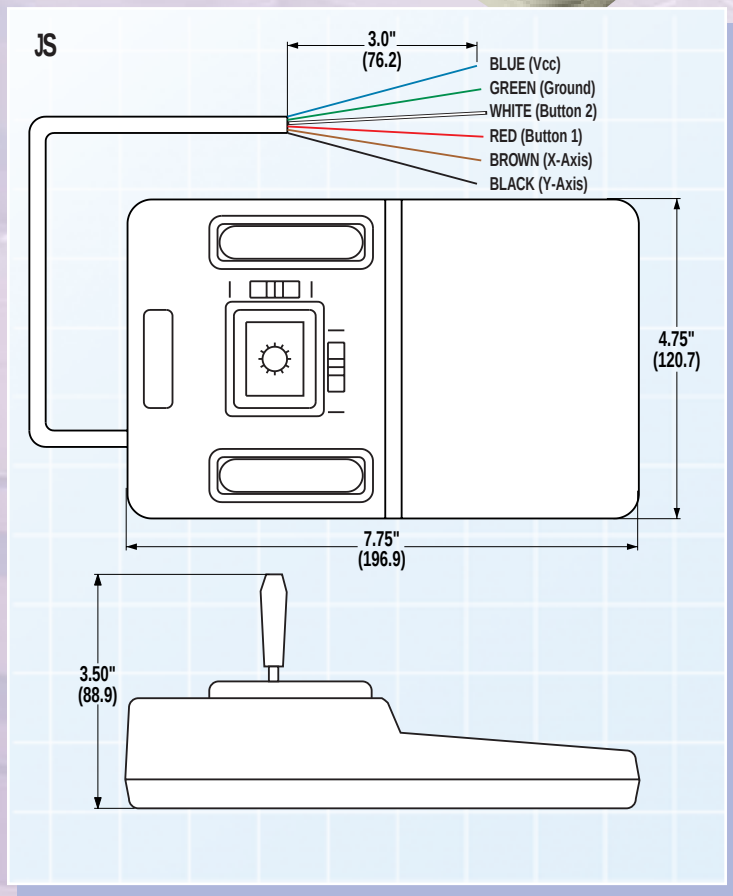
BRUSH LESS

STEPPER

BRUSHED DC

Ordering Information

Configuration Code	Tol-O-Matic Part #
JS	3600-9162



SPECIFICATIONS

SPECIFICATIONS	JS Joystick
Joystick Travel	27° from design center in all directions
Mechanical Life Cycle	5 million (minimum)
Trim Movement (Optional)	±7° (total trim 14°) for each axis
Main Ball Pivot	Precision ground stainless steel
Stick Shaft	3/16" brass plated
Potentiometers	Set at center of resistance
Potentiometer Calibration	Thumb tab provides up to 114° of potentiometer calibration
Return to Center Repeatability	±1%
Deflection Force	.14 lbs. at 27° at 2-7/8" from pivot point
Switches	2 elongated pushbutton switches
Cable	Integrated 7' (2.1m) cable with strain relief

SIT HAND HELD USER INTERFACE

SPECIFICATIONS • DIMENSIONS

For user interaction with the SSC 1-4 multi-function controllers the SIT hand held user interface provides flexibility and setup simplicity. The Tol-O-Motion SS software (included with the SSC 1-4 controllers) has a setup page for use with the SIT to allow the controller to status the user, or to prompt the user for information, eliminating the need for a PC following setup.

SPECIFICATIONS

SPECIFICATIONS	SIT Hand Held User Interface
Weight	8.0 oz. (.23 Kg.)
Character Set	ASCII with upper case transmit, upper and lower case receive
Case	Molded, high impact ABS with retractable hanger
Keypad	15 user-programmable function keys
Display	Transreflective LCD with 5 by 7 character font
Power Requirements	30 mA maximum, regulated, 5 Vdc ±5% (Received through RS 232 cable)
Speaker	Audible key click, bell and alert
Storage Temperature	-4° F (-20° C) to 158° F (+70° C)
Operating Temperature	32°F (0° C) to 122° F (+50° C)
Relative Humidity	10% to 90% non-condensing

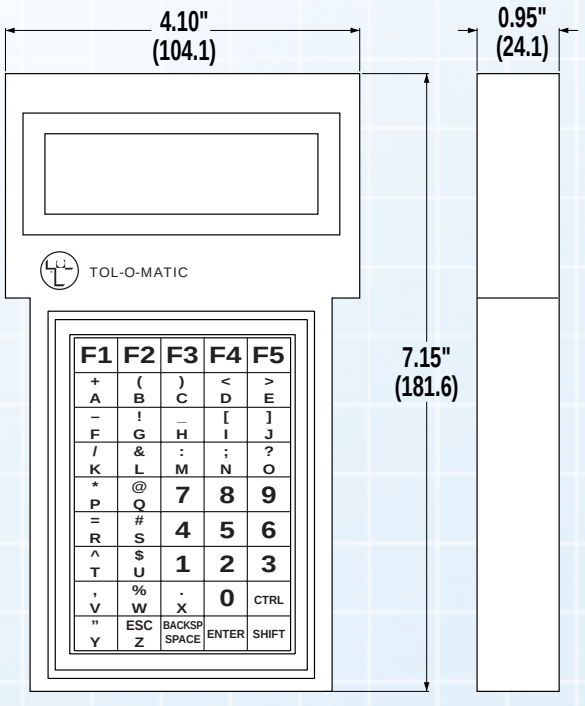
Features:

- ***45 key, alpha-numeric tactile keypad***
- ***4 row by 20 character LCD display***
- ***Rugged, high impact ABS housing***
- ***7 foot (2.1m) RS232 cable with 9-pin "D" connector*** for connection to the SSC 1-4
- ***5 Vdc power*** supplied from SSC 1-4 controller over RS232

Ordering Information

Configuration Code	Tol-O-Matic Part #
SIT	3600-9161

SIT



CABLES

SPECIFICATIONS • DIMENSIONS

Cables included for interconnection between motors, drives, and controllers are summarized below. For more specific information regarding cables and connectors see the respective components section of this catalog.

	Tol-O-Matic Code	Cables Included	Cable Length	Connectors	Replacement Part Number
MOTOR	MRS	Motor Power	12" (305mm)	Flying Lead	–
	MRBN	Motor Power	24" (610mm)	Flying Lead	–
	MRB	Motor Power	24" (610mm)	Flying Lead	–
		Encoder	18" (457mm)	Flying Lead	–
	MRV	Cables ordered as part of SSD Drive	–	–	–
DRIVE	MSD	–	–	–	–
	SSD	Controller	13' (4m)	J1 of SSD to Flying Lead	3600-1161
		Encoder	7' (2m), 13' (4m), or 20' (6m)	J2 of SSD to MRV Motor	3600-1162, 3600-1163, or 3600-1164
		Motor Power	20' (6m)	MRV Motor to Flying Lead	3600-1165
		RS232	7' (2m)	J3 of SSD to DB9 Female	3600-1173
	DMCLDC	–	–	–	–
CONTR-OLLER/ DRIVE	MSS	RS232	7' (2m)	MSS to DB9 Female	–
	MSCLDC	RS232	7' (2m)	MSCLDC to DB9 Female	–
CONTROLLER	MSC	RS232	7' (2m)	MSC to DB9 Female	–
	SSC	RS232	7' (2m)	SSC to DB9 Female	3600-1172
		Main/Driver Signals	3' (1m)	J2 of SSC to Screw Terminals	Ribbon 3600-1347, Breakout 3600-1342
		I/O	3' (1m)	J5 of SSC to Screw Terminals	Ribbon 3600-1346, Breakout 3600-1341
		Step/Dir Signals (only if using DMCLDC or MSD Drives)	3' (1m)	J4 of SSC to Screw Terminals	Ribbon 3600-1345, Breakout 3600-1340

CABLES

SPECIFICATIONS • DIMENSIONS

BRUSH LESS

STEPPER

BRUSHED DC

INTERFACE CABLES

*When ordering the SSD drives the RS232 cable is automatically included. The controller, encoder, and MRV motor cable are included by ordering CR2, CR4 or CR6 which selects the encoder cable length.

Controller Cable

(J1 to flying leads)

Encoder Cable

(J2 to MRV Series Motor Encoder Connector)

Length (A)	Configuration Code	Part No.
2 meter	CR2	3600-1162
4 meter	CR4	3600-1163
6 meter	CR6	3600-1164

MRV Series Motor Cable

Part Number	3600-1165

RS-232 Cable

Part Number	3600-1173

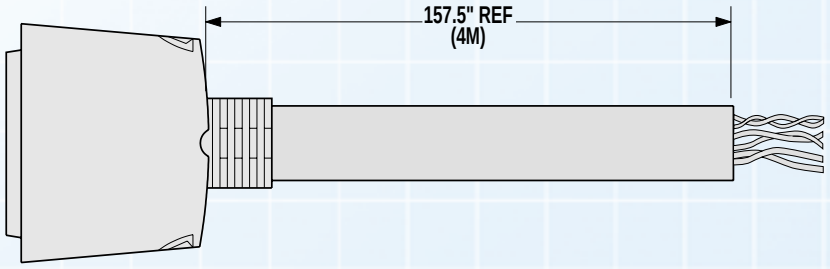
Mating Connectors Reference

Cross reference of mating connectors with J1, J2 connectors on drive.

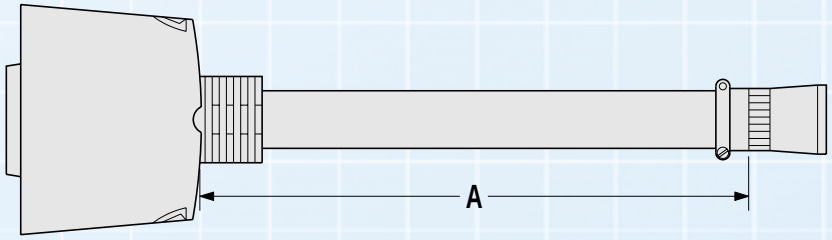
	J1	J2	Style
Connector	AMP 2-175677-7	AMP 2-175677-2	Solder
Backshell	AMP 176793-7	AMP 176793-2	
Connector	3M 10150-6000EC	3M 10120-6000EC	Crimp*
Backshell	3M 10350-A200-00	3M 10320-A200-00	
Connector	3M 10150-3000VE	3M 10120-3000VE	Crimp*
Backshell	3M 10350-52F0-008	3M 10320-52F0-008	

*For use with MDR Hand Press Tool Kit, 3M part number 3829

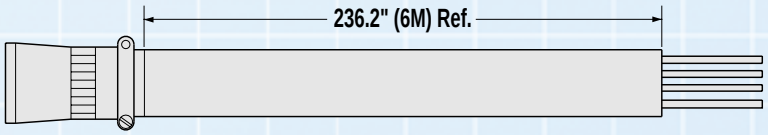
CONTROLLER CABLE



ENCODER CABLE



MRV MOTOR CABLE



UNIVERSAL SWITCHES

PERFORMANCE DATA • SPECIFICATIONS

Available for use on all of Tol-O-Matic's Axidyne actuators, these switches are activated by the cylinder's internal magnet, or on some actuators, the carrier mounted magnet. DC Reed, Hall-effect and AC Triac switches contain reverse polarity protection.

DC Reed Switches are designed for signalling end-of-stroke position to devices such as programmable controllers. They can be used to operate dc relays and solenoids if a protection circuit is used and if current and voltage limits are observed.

Hall-effect switches are available in either sinking type (NPN), or sourcing type (PNP). They are designed to signal devices such as programmable controllers, dc loads, and TTL or CMOS circuits.

AC Triac Reed Switches are designed for signalling end-of-stroke position to devices such as programmable controllers. They can be used to operate ac relays and solenoids if a protection circuit is used and if current and voltage limits are observed.

This chart is a quick reference to help select the correct Tol-O-Matic switch to use in your application. See the specifications for each switch to confirm your choice.

REQUIREMENTS	SWITCH				
	DC Reed Form C	DC Reed Form A	AC Triac Reed	DC Hall-effect Sinking	DC Hall-effect Sourcing
AC			•		
DC	•	•		•	•
Mechanical Switch	•	•	•		
Solid State Switch (Zero Bounce)				•	•
Input-Programmable Controller	•	•	•	•	•
Coil Direct	•	•	•		
Longest Life				•	•
Reverse Polarity Protection	•	•	•	•	•

Quick-Disconnect Couplers

Quick-disconnect couplers are available for all switches in 2m and 5m lengths. These couplers allow switches to be removed quickly and easily. Switch includes one male-end coupler (hard wired to switch) and one female-end coupler with additional cable for in-line splice. Replacement switch with hard-wired male-end connector is available as a service part.

Note: Quick-disconnect coupler is positioned 6" from the sensor.

UNIVERSAL SWITCHES

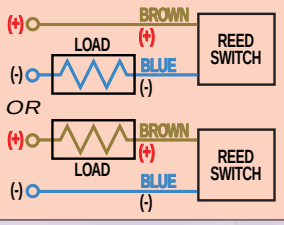
PERFORMANCE DATA • SPECIFICATIONS

Reed Switches

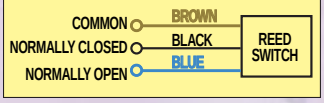
See the following pages for mounting dimensions.

NOTE: Cable is UNSHIELDED. Reed switches can be used to operate relays and solenoids if a protection circuit is used and if current, wattage and voltage limits are observed. (Call the factory for more information.)

REED SWITCH, FORM A WIRING DIAGRAM



REED SWITCH, FORM C WIRING DIAGRAM



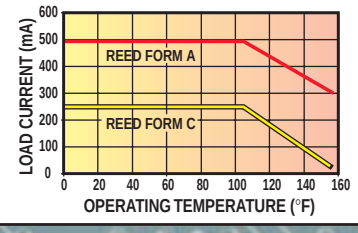
PERFORMANCE DATA

DC REED SWITCH SPECIFICATIONS

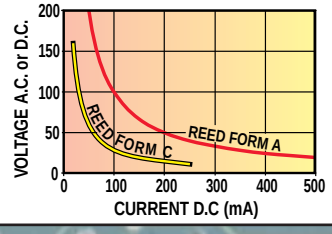
SPECS	REED SWITCH – FORM A	REED SWITCH – FORM C
CONTACTS	Single-pole, single-throw, normally open	Single-pole, double-throw, normally-open / normally-closed
CONTACT RATING	10 Watts, maximum current 500mA (not to exceed 10VA) (Refer to Temperature vs. Current and Voltage Derating charts.)	3 Watts, maximum current 250mA (not to exceed 3VA) (Refer to Temperature vs. Current and Voltage Derating charts.)
INPUT VOLTAGE	200Vdc maximum	120Vdc/ac maximum
RESISTANCE	0.1 Ω Initial (Maximum)	0.1 Ω Initial (Maximum)
RELEASE TIME	1.0 msec. maximum	1.0 msec. maximum
OPERATING TIME	0.6 msec. maximum (including bounce)	0.7 msec. maximum (including bounce)
OPERATING TEMP.	-40° F (-40° C) to 158° F (70° C)	-40° F (-40° C) to 158° F (70° C)
INDICATOR	Red LED lit when 4mA min. flows through contacts	None
*LIFE EXPECTANCY	Up to 200,000,000 cycles (depending on load current,duty cycle and environmental conditions)	Up to 200,000,000 cycles (depending on load current,duty cycle and environmental conditions)
CABLE	5 meter with PVC jacket 2m or 5m Quick-Disconnect with PVC jacket	5 meter with PVC jacket 2m or 5m Quick-Disconnect with PVC jacket
VOLTAGE DROP	2.6V typical @ 100mA	NA

* Data available from manufacturer.

TEMPERATURE VS CURRENT

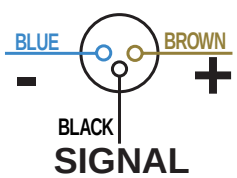


VOLTAGE DERATING

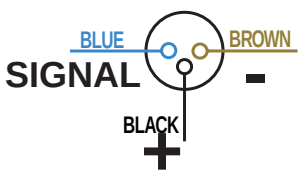


AN IMPORTANT NOTE Regarding Field Retrofit of Quick-Disconnect Couplers: If replacing a Quick-Disconnect switch manufactured before 7-1-97 it will also be necessary to replace or rewire the female-end coupler with the in-line splice.

CURRENT – Quick Disconnect Wiring



OLD – Quick-Disconnect Wiring

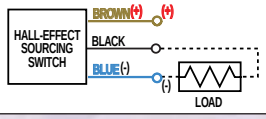


DC Hall-effect Switches

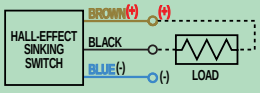
Refer to next pages for mounting data.

NOTE: Cable is UNSHIELDED.

HALL-EFFECT SOURCING SWITCH WIRING DIAGRAM



HALL-EFFECT SINKING SWITCH WIRING DIAGRAM



PERFORMANCE DATA

DC HALL-EFFECT SWITCH SPECIFICATIONS

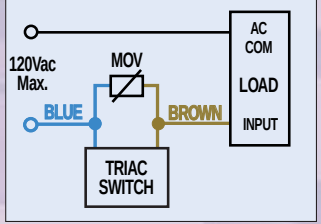
SPECIFICATIONS	HALL-EFFECT SOURCING	HALL-EFFECT SINKING
INPUT VOLTAGE	5 to 25 Vdc	5 to 25 Vdc
OUTPUT	Open collector transistor switch	Open collector transistor switch
OUTPUT RATING	25 Vdc, 200mA dc	25 Vdc, 200mA dc
ON TRIP POINT	150 Gauss maximum	150 Gauss maximum
OFF TRIP POINT	40 Gauss minimum	40 Gauss minimum
OPERATING TEMP.	0° F (-18° C) to 150° F (66° C)	0° F (-18° C) to 150° F (66° C)
OPERATING SPEED	< 10 micro sec.	< 10 micro sec.
INDICATOR	Red LED lit when sensor is activated	Red LED lit when sensor is activated
CABLE	5 meter with PVC jacket 2m or 5m Quick-Disconnect with PVC jacket	5 meter with PVC jacket 2m or 5m Quick-Disconnect with PVC jacket

AC Triac Reed Switches

See next pages for mounting dimensions.

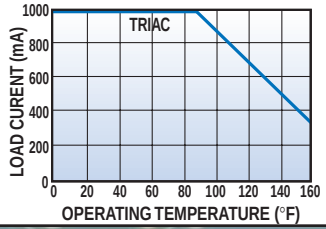
NOTE: Cable is UNSHIELDED. Reed switches can be used to operate relays and solenoids if a protection circuit is used and if current, wattage and voltage limits are observed. (Call the factory for more information.)

TRIAC REED SWITCH WIRING DIAGRAM



PERFORMANCE DATA

TEMPERATURE vs CURRENT



* Data available from manufacturer.

AC TRIAC REED SWITCH SPECIFICATIONS

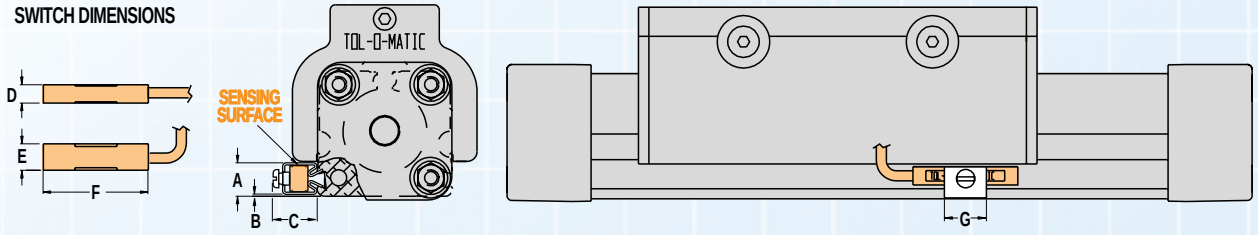
SPECIFICATIONS	TRIAC SWITCH
CONTACTS	Single-pole, single-throw, normally open
INPUT VOLTAGE	120Vac maximum
FREQUENCY	47 - 63 Hz
CONTINUOUS CURRENT	1 Amp at 86° F (30° C); 0.5 Amp at 140° F (60° C)
PEAK SURGE CURRENT	10 Amp
OPERATING TEMP.	-40° F (-40° C) to 158° F (70° C)
INDICATOR	None
LIFE EXPECTANCY*	Up to 200,000,000 cycles (depending on load current,duty cycle and environmental conditions)
CABLE	5 meter with PVC jacket 2m or 5m Quick-Disconnect with PVC jacket

UNIVERSAL SWITCHES

PERFORMANCE DATA • SPECIFICATIONS

BCS, MCS, BCB SWITCH DIMENSIONS

SWITCH DIMENSIONS



MODEL	A	B	C	D	E	F	G
BCS10	.38	.010	.48	.219	.315	1.250	.500
BCS15 / BCB15	.38	.19	.52	.219	.315	1.250	.500
BCS20	.38	.39	.53	.219	.315	1.250	.500

Dimensions in inches

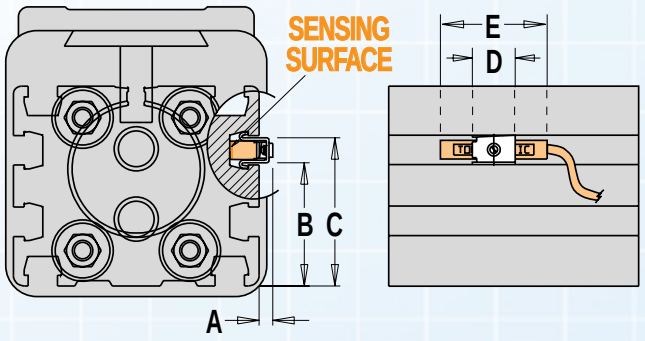
NOTE: The scored face of the switch indicates the sensing surface and must face toward the magnet.

MODEL	A	B	C	D	E	F	G
MCS10	9.73	0.28	11.38	5.56	8.00	31.75	12.70
MCS15	13.92	4.09	10.97	5.56	8.00	31.75	12.70
MCS20	18.59	8.74	11.38	5.56	8.00	31.75	12.70

Dimensions in millimeters

Some actuators may require switch mounting on a specific side of the assembly. Call Tol-O-Matic 1-800-328-2174 for details.

B3S, M3S, B3B, M3B SWITCH DIMENSIONS



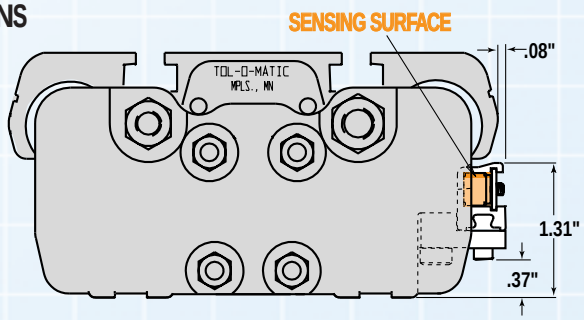
MODEL	A	B	C	D	E
B3S10 / B3B10	.194	.822	.906	.500	1.250
B3S15 / B3B15	.160	1.428	1.721	.500	1.250
B3S20 / B3B20	.036	1.994	2.287	.500	1.250

Dimensions in inches

MODEL	A	B	C	D	E
M3S10 / M3B10	4.93	20.88	23.01	12.70	31.75
M3S15 / M3B15	4.06	36.27	43.71	12.70	31.75
M3S20 / M3B20	0.91	50.65	58.09	12.70	31.75

Dimensions in millimeters

SLS10, MLS10 SWITCH DIMENSIONS



Axidyne®
SYSTEM
ORDERING
5-DAY DELIVERY IS STANDARD!

AXIDYNE ACTUATORS, MOTORS AND CONTROLS

SELECT THE ACTUATOR REQUIREMENTS

BASE MODEL | MODEL OPTIONS

1. MODEL TYPE

BCS	BCS Series Standard Electric Screw Cylinder
MCS	BCS Series Metric Electric Screw Cylinder
SLS	Linear Slide Standard Electric Screw
MLS	Linear Slide Metric Electric Screw
B3S	B3S Series Standard Electric Screw Cylinder
B3SD	B3S Series Standard Electric Screw Cylinder with Dual 180˚ Carrier
M3S	B3S Series Metric Electric Screw Cylinder
M3SD	B3S Series Metric Electric Screw Cylinder with Dual 180˚ Carrier
BCB	BCB Series Standard Belt-Drive Cylinder
B3B	B3B Series Standard Belt-Drive Cylinder
B3BD	B3B Series Standard Belt-Drive Cylinder with Dual 180˚ Carrier
M3B	B3B Series Metric Belt-Drive Cylinder
M3BD	B3B Series Metric Belt-Drive Cylinder with Dual 180˚ Carrier

2. TUBE BORE DIAMETER

10	1-inch (25 mm) bore
15	1½-inch (40 mm) bore
20	2-inch (50 mm) bore

3. NUT/SCREW CONFIGURATION (Screw-Drive Models Only)

SN	Solid Nut, Standard Rolled
SNA	Solid Nut, Standard Rolled, Anti-backlash
BN	Ball Nut, Precision Rolled
BNL	Ball Nut, Precision Rolled, Low-backlash

4. LEAD SCREW PITCH (Screw-Drive Models Only)

STANDARD MODELS		METRIC MODELS	
01	1 Turn per Inch	02	2.5 mm per Turn
02	2 Turns per Inch	05	5 mm per Turn
04	4 Turns per Inch	12	12 mm per Turn
05	5 Turns per Inch	25	25 mm per Turn
08	8 Turns per Inch		
16	16 Turns per Inch		

5. BELT MATERIAL AND WIDTH (Belt-Drive Actuators Only)

BWP05	½-inch Polyurethane/Steel Belt (BCB15)
BWN07	¾-inch Neoprene/Fiberglass Belt (BCB15)
BWN05	½-inch NeopRene/Fiberglass Belt (B3B10)
BWN10	1-inch Neoprene/Fiberglass Belt (B3B15)
BWN15	1.18-inch Neoprene/Fiberglass Belt (B3B20)

6. STROKE LENGTH

SK	Stroke, then enter desired stroke length in decimal inches

7. TUBE SUPPORTS AND MOUNTING PLATES (both may be selected)

TS_	Tube Supports and the quantity desired
MP	Mounting Plates

8. FLOATING MOUNT BRACKET (BCS and BCB Series Only)

FL	If Floating Mount Bracket is desired

9. DUAL (AUXILIARY) CARRIER

DC_ _	Dual Carrier, then center-to-center spacing desired in decimal inches. (Center-to-Center spacing will add to overall deadlength and will not subtract from the stroke length.)

10. SWITCHES

RM_	Reed Switch (Form A) with 5-meter lead/QD, and quantity desired
RU_	Reed Switch (Form A) with 2-meter lead/QD, and quantity desired
RT_	Reed Switch (Form A) with 5-meter lead, and quantity desired
BM_	Reed Switch (Form C) with 5-meter lead/QD, and quantity desired
BU_	Reed Switch (Form C) with 2-meter lead/QD, and quantity desired
BT_	Reed Switch (Form C) with 5-meter lead, and quantity desired
KM_	Hall-effect Sinking Switch with 5-meter lead/QD, and quantity desired
KU_	Hall-effect Sinking Switch with 2-meter lead/QD, and quantity desired
KT_	Hall-effect Sinking Switch with 5-meter lead, and quantity desired
TM_	Hall-effect Sourcing Switch with 5-meter lead/QD, and quantity desired
TU_	Hall-effect Sourcing Switch with 2-meter lead/QD, and quantity desired
TT_	Hall-effect Sourcing Switch with 5-meter lead, and quantity desired
CM_	TRIAC Switch with 5-meter lead/QD, and quantity desired
CU_	TRIAC Switch with 2-meter lead/QD, and quantity desired
CT_	TRIAC Switch with 5-meter lead, and quantity desired

11. MOTOR MOUNTING / REDUCTIONS

BELT-DRIVE (BCB) DIRECT MOUNT

DDR	Direct Drive on right
DDL	Direct Drive on left
RDTL	3:1 Reduction Drive on top left
RDTR	3:1 Reduction Drive on top right
RDBL	3:1 Reduction Drive on bottom left
RDBR	3:1 Reduction Drive on bottom right

BELT- DRIVE (BCB/B3B) Stub Shaft Orientation

SDL	Direct Drive on left
SDR	Direct Drive on right

B3B BELT-DRIVE ONLY

SDTL	3:1 Reduction Drive on top left
SDTR	3:1 Reduction Drive on top right
SDBL	3:1 Reduction Drive on bottom left
SDBR	3:1 Reduction Drive on bottom right

SCREW-DRIVE ACTUATORS

LMI	In-Line mounting
RPL1	1:1 Reverse-Parallel mount left
RPR1	1:1 Reverse-Parallel mount right
RPB1	1:1 Reverse-Parallel mount bottom
RPT1	1:1 Reverse-Parallel mount top
RPL2	2:1 Reverse-Parallel mount left
RPR2	2:1 Reverse-Parallel mount right
RPB2	2:1 Reverse-Parallel mount bottom
RPT2	2:1 Reverse-Parallel mount top

GEARHEADS (For Direct-Drive or In-Line mounting configurations only)

GHK20	Gearhead for ¼-inch shaft, 23 frame motor, reduction ratio of 5.5
GHK30	Gearhead for ⅜-inch shaft, 34 frame motor, reduction ratio of 5.5
GHJ20	Gearhead for ½-inch shaft, 23 frame motor, reduction ratio of 5.5
GHJ21	Gearhead for ½-inch shaft, 23 frame motor, reduction ratio of 10
GHJ30	Gearhead for ½-inch shaft, 34 frame motor, reduction ratio of 5.5
GHJ31	Gearhead for ½-inch shaft, 34 frame motor, reduction ratio of 10

SELECT THE MOTOR AND CONTROL REQUIREMENTS

MOTOR/DRIVE/CONTROLLER

[ ][ ][ ][ ][ ][12][ ][ ][ ][ ][ ][13][ ][ ][ ][ ]

CABLING AND INTERFACES

[ ][ ][ ][14][ ][ ][ ][15][ ][ ]

12. MOTOR / DRIVE TYPE / SIZE

MRB___ Dc Brush Motor, then add motor frame size (231, 341, 342, 401 or 402)
MRS___ Stepper Motor, then add motor frame size (231, 232, 341, 342, or 343)
MRV___ Brushless Servo Motor, then add frame size (231, 232, 233, 234, 341, 342, or 343)

FOR OPEN LOOP DC ONLY

MRB___N Dc Brush Motor, then add motor frame size (231, 341, 342, 401 or 402), and "N" for no encoder
DM5 Open Loop Dc Drive, 32 volt/15 Amp
DM6 Open Loop Dc Drive, 48 volt/10 Amp

NO MOTOR DRIVE/MOTOR OPTION

X Add, if motor Drive is NOT required
XY* Motor(s) supplied by customer, Tol-O-Matic to mount using standard hardware and couplers
XJ* Motor(s) supplied and mounted by customer, Tol-O-Matic to furnish standard hardware and couplers

Once motor type and frame size is selected, the configurator picks the appropriate adapter and couplers required.

If X is selected, the configuration string is complete.
If X is NOT selected, the configurator determines compatible drive selections based on motor choice. If no controller is selected in (13). below, it will choose the DMCLDC for MRB motor; MSD for MRS motor; or SSD for MRV motor and configuration string is complete.
*** NOTE: For XY and XJ options, customer must provide full endface and shaft dimensions prior to ordering actuator. Customer motors must be directly interchangeable with Tol-O-Matic motors.**

13. CONTROLLER / DRIVE

SINGLE AXIS APPLICATIONS

MS Code used to order the following:
MSCLDC controller/drive if MRB motor is selected
MSS controller/drive if MRS motor is selected
MSC controller and SSD drive if MRV motor is selected
SSC10 Stepper/Servo Controller, 1 axis application
(Configurator will select either the DMCLDC drive if MRB motor; SSD drive if MRV motor; or MSD if MRS motor is chosen in (12.) above.

FOR OPEN LOOP DC ONLY

C Add to DM5 or DM6 open loop drive to include controller

MULTI AXIS APPLICATIONS

2 Axis Application

	2nd Axis	*1st Axis*
SSC21	Stepper	Determined by Drive
SSC22	Servo	Determined by Drive

3 Axis Application

	3rd Axis	*2nd Axis*	*1st Axis*
SSC31	Stepper	Stepper	Determined by Drive
SSC32	Stepper	Servo	Determined by Drive
SSC33	Servo	Stepper	Determined by Drive
SSC34	Servo	Servo	Determined by Drive

4 Axis Application

	4th Axis	*3rd Axis*	*2nd Axis*	*1st Axis*
SSC41	Stepper	Stepper	Stepper	Determined by Drive
SSC42	Stepper	Stepper	Servo	Determined by Drive
SSC43	Stepper	Servo	Stepper	Determined by Drive
SSC44	Stepper	Servo	Servo	Determined by Drive
SSC45	Servo	Stepper	Stepper	Determined by Drive
SSC46	Servo	Stepper	Servo	Determined by Drive
SSC47	Servo	Servo	Stepper	Determined by Drive
SSC48	Servo	Servo	Servo	Determined by Drive

14. CABLING

For MSC, MSCLDC, MSS, DM5C and DM6C drive/controllers:
RS232 cables are automatically included
For SSD Drives:
RS232 cable is included.
Power Cable (6 meters), Controller Cable (4 meters) and Encoder Cable are included by specifying the encoder cable length.
CR2 2 meter encoder cable, power cable, controller cable
CR4 4 meter encoder cable, power cable, controller cable
CR6 6 meter encoder cable, power cable, controller cable
For SSC Controllers:
Cables included are: RS232, 2 foot ribbon cables and DIN rail mount breakout terminals.
If terminal blocks are not required, enter:
BON No breakout terminals
For Motors:
MRS motors: include 12-inch leads
MRB motors: include 24-inch power leads and 18-inch encoder leads
MRV motors: do not include cables (they are included with drive) and are supplied with MS connectors

15. CONTROLLER INTERFACES

PIT Panel user interface
SIT Hand-held user interface
JS Joy Stick

CONFIGURATOR EXAMPLE

BASE MODEL AND OPTIONS

[B][3][S][1][0][S][N][0][2][S][K][3][0][T][S][1][K][T][3][L][M][I]
1 2 3 4 6 7 10 11

MOTOR / DRIVE / CONTROLLER • CABLING AND INTERFACES

[M][R][V][2][3][2][S][S][C][2][1][C][R][4][J][S]
12 13 13 13

The following example describes a: U.S. standard B3S10 screw-drive actuator with a solid, standard rolled nut and a lead screw pitch of 2 turns per inch and a stroke of 30 inches. Actuator options include one set of tube supports, three Hall-effect sinking switches with 5-meter leads and a in-line motor mounting configuration.

Motor selected is an MRV232 brushless servo motor. Controller selected is a SSC21 for a two axis application with the 2nd axis requiring a stepper drive. Because an MRV brushless servo motor has been selected, the configurator will automatically select the SSD drive for this application. The SSD drive requires a specified length of the encoder cable and in this a 4-meter cable has been selected along with a joystick operator interface.

FIELD RETROFIT KITS

Mounting Plates

See page 96
for part number and motor compatibility

Tube Supports

See page 94

Model	Part #
BCS10, MCS10	4510-1010
BCS15, MCS15, BCB15	4515-1010
BCS20, MCS20	4520-1010
B3S10, M3S10	3410-9006
B3S15, M3S15	3415-9006
B3S20, M3S20	3420-9006

Floating Mount Bracket

See page 93

Model	Part #
BCS10	0510-9007
MCS10	0510-9007
BCS15	0515-9007
MCS15	0515-9007
BCB15	0515-9007
BCS20	0520-9007
MCS20	0520-9007

Motor Mounts and Couplers

See pages 99-102 and 119

Gearheads

See page 103-111 and 119

Controllers

See page 20 - 29

Model	Part #
SSC	See page 26
MSC	3600-9605

Cables

See page 127-128

Controller/Drives

See page 30 - 38

Model	Part #
MSS	3600-9603
MSCLDC	3600-0037
DM5C	3600-0106
DM6C	3600-0107

Drives

See page 39 - 49

Model	Part #
SSD05	3600-9600
SSD10	3600-9601
SSD20	3600-9602
MSD	3600-9604
DMCLDC	3600-0049
DM5	3600-0406
DM6	3600-0407

Motors

See pages 50 - 62

Model	Part #	Model	Part #
MRV231	3600-6120	MRS343	3600-6134
MRV232	3600-6122	MRB231	3600-6145
MRV233	3600-6123	MRB341	3600-6146
MRV234	3600-6124	MRB342	3600-6147
MRV341	3600-6125	MRB401	3600-6148
MRV342	3600-6126	MRB402	3600-6149
MRV343	3600-6127	MRB231N	3600-6140
MRS231	3600-6130	MRB241N	3600-6141
MRS232	3600-6131	MRB242N	3600-6142
MRS341	3600-6132	MRB401N	3600-6143
MRS342	3600-6133	MRB402N	3600-6144

Controller Interfaces

see pages 118 - 120

Model	Part #
PIT	3600-9607
JS	3600-9162
SIT	3600-9161

Switches

See page 129-132

Type	Config. No.***	Part No.**
Reed Switch (Form A), 5 meter lead with quick-disconnect	RM	3600-9083*
Reed Switch (Form A), 2 meter lead with quick-disconnect	RU	3600-9083*
Reed Switch (Form A), 5 meter lead	RT	3600-9082
Reed Switch (Form C), 5 meter lead with quick-disconnect	BM	3600-9085*
Reed Switch (Form C), 2 meter lead with quick-disconnect	BU	3600-9085*
Reed Switch (Form C), 5 meter lead	BT	3600-9084
Hall-effect Sinking Switch, 5 meter lead with quick-disconnect	KM	3600-9091*
Hall-effect Sinking Switch, 2 meter lead with quick-disconnect	KU	3600-9091*
Hall-effect Sinking Switch, 5 meter lead	KT	3600-9090
Hall-effect Sourcing Switch, 5 meter lead with quick-disconnect	TM	3600-9089*
Hall-effect Sourcing Switch, 2 meter lead with quick-disconnect	TU	3600-9089*
Hall-effect Sourcing Switch, 5 meter lead	TT	3600-9088
TRIAC Switch, 5 meter lead with quick-disconnect	CM	3600-9087*
TRIAC Switch, 2 meter lead with quick-disconnect	CU	3600-9087*
TRIAC Switch, 5 meter lead	CT	3600-9086
Connector (Female), 2 meter lead		2503-1021
Connector (Female), 5 meter lead		2503-1025

* Sensor 6" from male coupler on Quick-disconnect units
** Switch Only
*** Includes Switch and Hardware Kit

To order field retrofit switch and hardware kits for all Tol-O-Matic actuators:
SW (Then the model and bore size, and type of switch needed)

Example: SWBCS15RT (Hardware and Form A Reed switch, 5 meter lead for BCS15)

IMPORTANT NOTES:

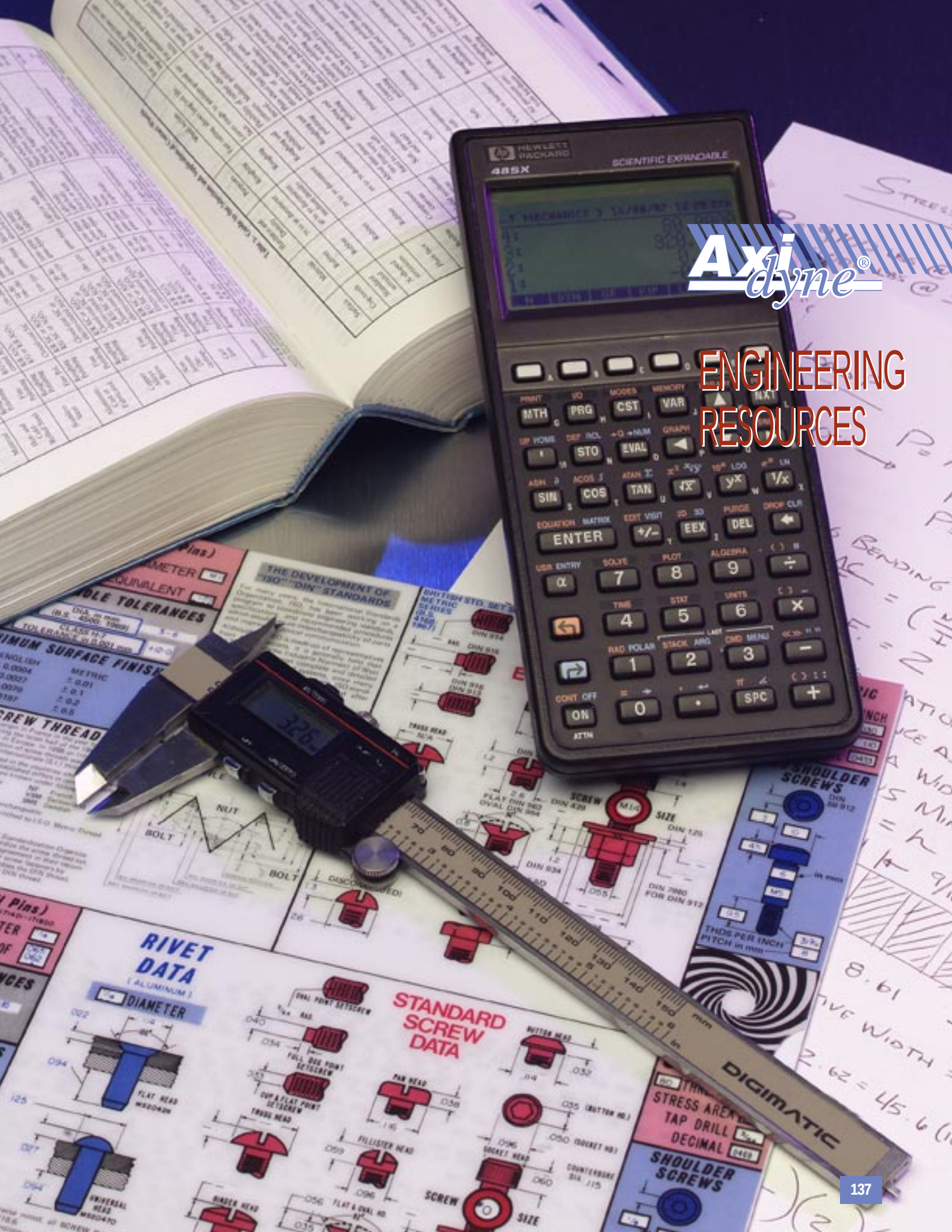
1 Mounting hardware is required if replacing switch for any actuator manufactured before 7/1/97.

2 If field retrofitting a quick-disconnect switch on and actuator manufactured before 7/1/97 it will be necessary to rewire connections. See page 130

3 Contact Tol-O-Matic regarding magnet requirements for actuators that did not previously have a switch or if replacing a Reed or Triac switch with a Hall-effect switch.

4 For field retrofit of SLS and MLS actuators that do not currently have the rail it will be necessary to order the rail and indicate stroke length.

SLS10 & MLS10 Part # 0610-9100


Axidyne®
ENGINEERING
RESOURCES
HEWLETT PACKARD
48SX
SCIENTIFIC EXPANDABLE
RIVET DATA
STANDARD SCREW DATA
SHOULDER SCREWS
DIGIMATIC

GLOSSARY OF TERMS

Absolute Move
A move with reference to a fixed absolute zero location.

AC Servo
Motor/Drive that generates sinusoidal motor currents and sinusoidal back EMF in a brushless motor.

Accuracy
Measure of the difference between ideal predicted position and actual position of a motor or mechanical system.

Acme Screw/Nut
Threaded screw and nut design which utilizes sliding surfaces between the two. Typical efficiencies are between 60-70%.

Back EMF
Voltage produced across a motor winding due to the winding turns being cut by a magnetic field. This voltage is directly proportional to rotor velocity and is opposite in polarity to the applied voltage.

Backlash
Linear distance which is lost in positioning the nut or carrier when the screw direction of rotation changes.

Ball Screw/Nut
Screw and nut design utilizing a nut that contains one or more circuits of recirculating steel balls which roll between the screw and nut.

Baud Rate
Number of binary bits transmitted per second in a serial communication system.

Breakaway Torque
Torque required to start an actuator in motion. In an electric actuator this consists primarily of the torque to overcome the preload of the lead screw nut assembly and the static friction of the carrier bearings.

Brushless DC Servo
Motor/drive that generates trapezoidal motor currents and trapezoidal back EMF in a brushless motor.

Closed Loop
System where the output is measured and compared to the input. If this system is capable of making corrections to minimize the difference it is classified as a servo.

Critical Speed
Rotational speed of a lead screw at which the screw begins to oscillate or whip. This speed is dependent on the screw length and diameter.

Commutation
Switching of drive voltage to the motor windings necessary to provide continuous rotation. A brush motor uses mechanical switching through a brush-bar contact. Brushless motors use separate devices such as Hall Sensors to sense the rotor position. This information is then processed by the drive to determine the switching sequence.

Duty Cycle
Ratio of on time to total cycle time.

$$\text{Duty Cycle} = \frac{\text{On Time}}{(\text{On Time} + \text{Off Time})}$$

Efficiency
Ratio of power output to power input.

Encoder
Device used to provide relative position and velocity information to a drive or controller by sensing mechanical motion and providing a corresponding pulse rate as output.

Flatness
When traveling in a straight horizontal line, the vertical deviation above or below the horizontal plane of travel of the carrier.

Holding Torque
Maximum external torque that can be applied to a stopped, energized motor without causing the rotor to rotate.

Inertia
Measure of an object's resistance to change in motion that is a function of the object's mass and shape.

Inertia Match
If the reflected inertia of the load is equal to the rotor inertia of the motor, the system will operate optimally for efficiency and dynamic performance.

Lead
Linear travel of a lead screw nut or carriage for every one full rotation of the lead screw.

Moment Load
Rotational forces applied to the carrier equal to the linear force applied (weight) multiplied by the distance between the location of the force (center of gravity) and the surface center of the carrier. Typically expressed as yaw (Mv), pitch (M) and Roll (Ms).

Motion Profile
Definition of an objects position and velocity relationships in time during a move.

Microstepping
Type of drive that proportions the current in a step motor's windings to provide intermediate positions between full steps. Advantages over full and half stepping include smoothness of rotation and higher position resolution.

Open Loop
Motion control system where no position or velocity signals are provided for correction. Typically stepper systems run as open loop systems.

Optically Isolated
Transmission of a signal from one device to another with a light source and sensor, in order to avoid direct electrical contact.

Pitch
Number of revolutions required by a leadscrew to move the nut or carrier one inch.

PWM
Pulse Width Modulation is a method of controlling current in the windings of a motor by on-off switching of transistors to vary the duty cycle.

Repeatability
How accurately a positioning device can return to an exact location. This may be defined as unidirectional (does not include backlash), or bidirectional.

Resolution
The smallest position increment that can be achieved.

Resolver
A feedback device consisting of a stator and rotor, that provides position and velocity information to the drive for commutation.

RMS Torque
In an intermittent application, this is the torque provided to generate equivalent motor heating to one operating in a steady state.

$$Trms = \sqrt{\frac{\Sigma(Ti^2 \cdot ti)}{\Sigma ti}}$$

where: Ti = Torque during interval i
ti = Time of interval i

RS232
A standard for data communication that defines voltages and time requirements for information to be transferred on a single line in sequential format.

Servo
System that compares the output of a device (by monitoring position, velocity, and/or torque) with the desired outcome, and makes corrections to minimize the difference.

Servo Motor
Motor used in closed loop systems where feedback is used to control motor position, velocity, and/or torque, usually expected to have high torque/inertia ratio.

Stepper Motor
Motor which translates electrical pulses into motion, where the pulse rate controls velocity and position.

Slew
Constant non-zero velocity portion of a motion profile.

Static Torque
Maximum torque available at zero speed.

Stiffness
System ability to maintain accuracy when subject to disturbance.

Straightness
When traveling in a straight horizontal line, the side to side deviation within the horizontal plane of travel of the carrier.

Thrust
Measurement of linear force.

Torque
Measurement of force producing rotation.

Torque Constant
Torque generated in a DC motor per ampere applied to the windings.

$$Kt = \frac{T\ (oz.\text{-}in.)}{A\ (amp)}$$

Voltage Constant
Back EMF generated by a DC motor usually in units of volts per 1000 rpm.

CONVERSION TABLES

(TO CONVERT FROM A TO B, MULTIPLY BY ENTRY IN TABLE)

Length

A \ B	in	ft	yd	mm	cm	m
in	1	0.0833	.028	25.4	2.54	0.0254
ft	12	1	.333	304.8	30.48	0.3048
yd	36	3	1	914.4	91.44	.914
mm	0.03937	0.00328	1.09×10^{-3}	1	0.1	0.001
cm	0.3937	0.03281	1.09×10^{-2}	10	1	0.01
m	39.37	3.281	1.09	1000	100	1

Mass

A \ B	gm	kg	slug	lb(m)	oz(m)
gm	1	.001	6.852×10^{-5}	2.205×10^{-3}	.03527
kg	1000	1	6.852×10^{-2}	2.205	35.274
slug	14590	14.59	1	32.2	514.72
lb(m)	453.6	.45359	.0311	1	16
oz(m)	28.35	.02835	1.94×10^{-3}	.0625	1

Force

A \ B	lb(f)	N	dyne	oz(f)	kg(f)	gm(f)
lb(f)	1	4.4482	4.448×10^{5}	16	.45359	453.6
N	.22481	1	100.000	3.5967	.10197	---
dyne	2.248×10^{-6}	.00001	1	3.59×10^{-5}	---	980.6
oz(f)	.0625	.27801	2.78 x 104	1	.02835	28.35
kg(f)	2.205	9.80665	---	35.274	1	1000
gm(f)	2.205×10^{-3}	---	1.02×10^{-3}	.03527	.001	1

NOTE: lb(f) = 1 slug x 1 ft/s^2 N = 1 kg x 1 m/s^2 dyne = 1gm x 1 cm/s^2

Power

A \ B	Watts	KW	HP (English)	HP(Metric)	ft-lb/s	in-lb/s
Watts	1	1×10^{-3}	1.34×10^{-3}	1.36×10^{-3}	.74	8.88
kw	1000	1	1.34	1.36	738	8880
hp(English)	746	.746	1	1.01	550	6600
hp(Metric)	736	.736	.986	1	543	6516
ft-lb/s	1.35	1.36×10^{-3}	1.82×10^{-3}	1.84×10^{-3}	1	12
in-lb/s	.113	1.13×10^{-4}	1.52×10^{-4}	1.53×10^{-4}	8.3×10^{-2}	1

Torque

A \ B	dyne-cm	gm-cm	oz-in	kg-cm	lb-in	N-m	lb/ft	kg/m
dyne-cm	1	1.019×10^{-2}	1.416×10^{-5}	1.0197×10^{-6}	8.850×10^{-7}	10^{-7}	7.375×10^{-6}	1.019×10^{-6}
gm-cm	980.665	1	1.388×10^{-2}	10-3	8.679×10^{-4}	9.806×10^{-5}	7.233×10^{-5}	10^{-5}
oz-in	7.061×10^{4}	72.007	1	7.200×10^{-2}	6.25×10^{-2}	7.061×10^{-3}	5.208×10^{-3}	7.200×10^{-4}
kg-cm	9.806×10^{5}	1000	13.877	1	.8679	9.806×10^{-2}	7.233×10^{-2}	10^{-2}
lb-in	1.129×10^{6}	1.152×10^{3}	16	1.152	1	.112	8.333×10^{-2}	1.152×10^{-2}
N-m	10^{7}	1.019×10^{4}	141.612	10.197	8.850	1	.737	.102
lb-ft	1.355×10^{7}	1.382×10^{4}	192	13.825	12	1.355	1	.138
kg-m	9.806×10^{7}	10^{5}	1.388×10^{3}	100	86.796	9.806	7.233	1

Temperature

°F = (1.8 x°C) + 32
°C = .555 (°F - 32)

Gravity

(Acceleration Constant)
g = 386 in/s^2 = 32.2 ft/s^2 = 9.8 m/s^2

Inertia (Rotary)

NOTE: Mass inertia = $\frac{\text{wt. inertia}}{g}$

A \ B	gm-cm²	oz-in²	gm-cm-s²	kg-cm²	lb-in²	oz-in-s²	lb-ft²	kg-cm-s²	lb-in-s²	lb-ft-s² or slug-ft-s²
gm-cm²	1	5.46×10^{-2}	1.01×10^{-3}	10^{-3}	3.417×10^{-4}	1.41×10^{-5}	2.37×10^{-6}	1.01×10^{-4}	8.85×10^{-7}	7.37×10^{-4}
oz-in²	182.9	1	.186	.182	.0625	2.59×10^{-2}	4.34×10^{-4}	1.86×10^{-4}	1.61×10^{-4}	1.34×10^{-5}
gm-cm-s²	980.6	5.36	1	.9806	.335	1.38×10^{-2}	2.32×10^{-3}	10^{-3}	8.67×10^{-4}	7.23×10^{-5}
kg-cm²	1000	5.46	1.019	1	.3417	1.41×10^{-2}	2.37×10^{-3}	1.019×10^{-3}	8.85×10^{-4}	7.37×10^{-5}
lb-in²	2.92×10^{3}	16	2.984	2.925	1	4.14×10^{-2}	6.94×10^{-3}	2.96×10^{-3}	2.59×10^{-3}	2.15×10^{-4}
oz-in-s²	7.06×10^{4}	386.08	72.0	70.615	24.13	1	.1675	7.20×10^{-2}	6.25×10^{-2}	5.20×10^{-3}
lb-ft²	4.21×10^{5}	2304	429.71	421.40	144	5.967	1	.4297	.3729	3.10×10^{-2}
kg-cm-s²	9.8×10^{5}	5.36×10^{3}	1000	980.66	335.1	13.887	2.327	1	.8679	7.23×10^{-2}
lb-in-s²	1.129×10^{4}	6.177×10^{3}	1.152×10^{3}	1.129×10^{3}	386.08	16	2.681	1.152	1	8.33×10^{-2}
lb-ft-s²	1.355×10^{7}	7.41×10^{4}	1.38×10^{4}	1.35×10^{4}	4.63×10^{3}	192	32.17	13.825	12	1

Angular Velocity

A \ B	deg/s	rad/s	rpm	rps
deg/s	1	1.75×10^{-2}	.167	2.78×10^{-3}
rad/s	57.3	1	9.55	.159
rpm	6	.105	1	1.67×10^{-2}
rps	360	6.28	60	1

Linear Velocity

A \ B	in/min	ft/min	in/sec	ft/sec	mm/sec	m/sec
in/min	1	.0833	.0167	1.39×10^{-3}	0.42	4.2×10^{-4}
ft/min	12	1	.2	.0167	5.08	5.08×10^{-3}
in/sec	60	5	1	.083	25.4	.0254
ft/sec	720	60	12	1	304.8	.3048
cm/sec	23.62	1.97	.3937	.0328	10	0.01
m	2362.2	196.9	39.37	3.281	1000	1

Abbreviated Terms

C = Celsius	**hp** = horse power	**min** = minute	**rpm** = revs per minute
cm = centimeter	**in** = inch	**mm** = millimeter	**rps** = revs per second
F = Fahrenheit	**kg** = kilogram	**m** = meter	**s** = seconds
ft = foot	**kg(f)** = kilogram force	**N** = Newton	
g = gravity	**kw** = Kilowatt	**oz(f)** = ounce force	
gm = gram	**lb(f)** = pound force	**oz(m)** = ounce mass	
gm(f) = gram force	**lb(m)** = pound mass	**rad** = radians	

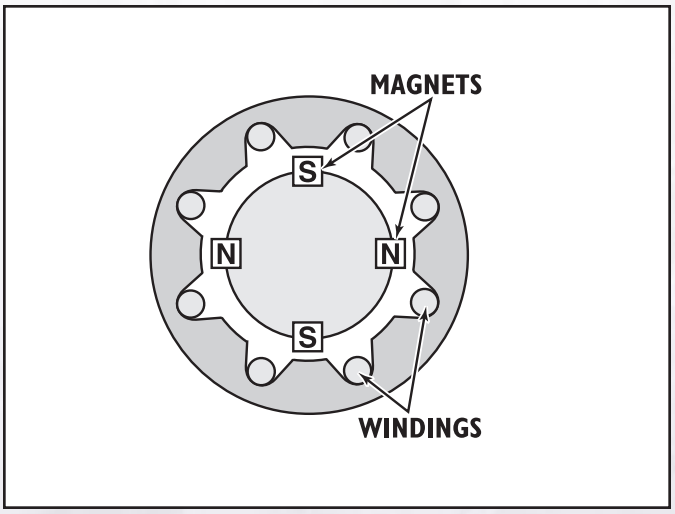
SELECTING A MOTOR/DRIVE TECHNOLOGY

BASIC SELECTION CRITERIA

ADVANTAGES OF A:

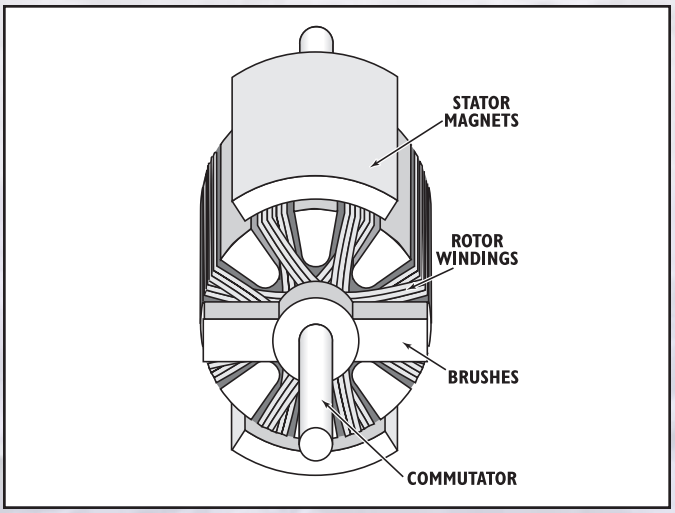
• Brushless Servo System

- ▲ Extremely smooth and quiet operation
- ▲ Good for high torques [up to 45 in-lbs. (5.08 N-m) continuous, 140 in-lbs. (15.82 N-m) peak]
- ▲ Good for high speeds, up to 6,000 RPM
- ▲ High resolution, 4,000 counts per revolution
- ▲ Provide torque control
- ▲ Good for short, repetitive moves
- ▲ Maintenance free
- ▲ No moving contacts



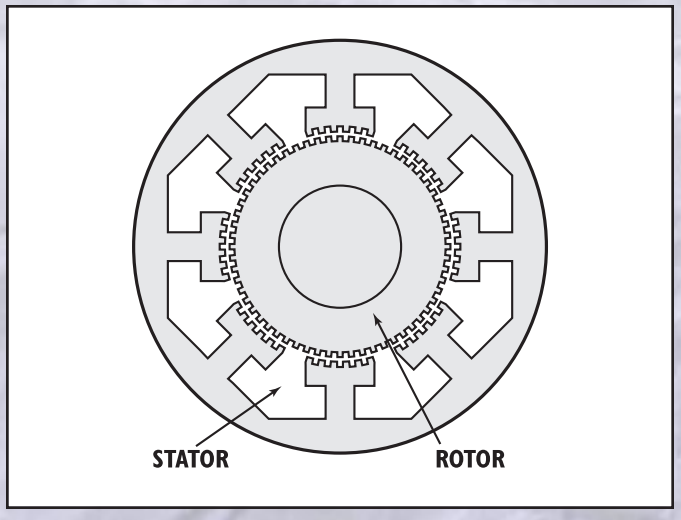
• Brushed DC System

- ▲ Low to medium cost
- ▲ Smooth and quiet operation
- ▲ Good for speeds generally less than 2500 rpm
- ▲ Good for torques up to 32 in-lbs. (3.62 N-m) continuous, 48 in-lbs. (5.42 N-m) peak
- ▲ Good for resolutions of 1,000 counts per revolution



• Microstepping System

- ▲ Lowest cost for precise positioning
- ▲ Highest resolution [up to 50,800 steps- rev] without feedback device
- ▲ Good for speeds less than 2,000 rpm
- ▲ Good for torque requirements less than 35 in-lbs. (3.95 N-m)
- ▲ Smoothness better than full or half step, but not as good as servos
- ▲ Good for short, repetitive moves
- ▲ Maintenance free
- ▲ No moving contacts



BASIC SIZING EQUATIONS

NOTE: USE TOL-O-MOTION SIZING & SELECTION SOFTWARE AND AVOID THE NEED FOR THESE EQUATIONS

Screw-Drive Torque: Required By Motor:

$$T_{TOTAL} = T_{ACC} + T_{FRICTION} + T_{PRELOAD} + T_{GRAVITY} + T_{EXT.} \quad \text{(oz.-in.)}$$

$$T_{ACC} = \frac{\omega}{386}\left[\frac{J_{LOAD}}{e}\left(\frac{m}{e'}\right) + J_{LS}\left(\frac{m}{e'}\right) + J_{RD} + J_{MOTOR}\right] \quad \text{(oz.-in.)}$$

$$J_{LOAD} = \frac{W_{LOAD} + W_{OTHER}}{(2\pi p)^2}\left(\frac{16\ oz.}{lb.}\right)\left(\frac{1}{m^2}\right) \quad \text{(oz.-in.}^2\text{)}$$

(reflected)

J_{LS} (reflected) =

Lead Screw Inertia vs. Length (for 1/4", 3/8", 1/2", 5/8" and 3/4" Dia. Screws)	
Screw Dia.	**Inertia**
1/4"	0.0017 oz•in² per inch of screw
3/8"	0.0087 oz•in² per inch of screw
1/2"	0.0275 oz•in² per inch of screw
5/8"	0.0671 oz•in² per inch of screw
3/4"	0.139 oz•in² per inch of screw

$\times \left(\frac{1}{m^2}\right)$ (oz.-in.²)

NOTE: Be sure to use TOTAL screw length, including dead length.

J_{MOTOR} = See Inertia in Motor Section (oz.-in.²)

(This will be an iterative process since the actual motor torque is unknown at this point)

J_{RD} = See Inertia for Reduction Device (oz.-in.²)

(reflected)

$$\omega = \frac{2\pi p V_M}{T_a} \quad \text{(rad/sec)}$$

Continues

Screw Drive Torque (cont.):

$$T_{FRICTION} = \frac{F_T}{2\pi pe}\left(\frac{16\text{ oz.}}{\text{lb}}\right)\left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

$$F_T = \text{See Friction Table in Actuator Sections}$$
OR
$$\mu(W_{LOAD} + W_{OTHER}) \quad \text{(lbs.)}$$

$$T_{PRELOAD} = \text{See Preload Torque in Actuator Sections} \times \left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

$$T_{GRAVITY} = \frac{(W_{LOAD} + W_{OTHER})\sin ø}{2\pi pe}\left(\frac{16\text{ oz.}}{\text{lb}}\right)\left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

$$T_{EXT.} = \frac{F_{EXT.}}{2\pi pe}\left(\frac{16\text{ oz.}}{\text{lb}}\right)\left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

Screw-Drive Thrust: Delivered by Nut

$$\text{Thrust} = 2\pi pe(e'm)\left(\frac{\text{lb.}}{16\text{ oz.}}\right)\left\{T_{TOTAL} - \left[J_{LS}\left(\frac{m}{e'}\right) + J_{RD} + J_{MOTOR}\right]\frac{\omega}{386} - T_{PRELOAD}\right\} \quad \text{(lbs.)}$$

Screw-Reflected Inertia:

$$J_{REFL} = J_{LOAD} + J_{LS} + J_{RD} \quad \text{(oz.-in.}^2\text{)}$$

Belt-Drive Torque:

$$T_{TOTAL} = T_{ACC} + T_{FRICTION} + T_{PRELOAD} + T_{GRAVITY} + T_{EXT.} \quad \text{(oz.-in.)}$$

$$T_{ACC} = \frac{\omega}{386}\left[\frac{J_{LOAD}}{e}\left(\frac{m}{e'}\right) + J_{WHEELS}\left(\frac{m}{e'}\right) + J_{RD} + J_{MOTOR}\right] \quad \text{(oz.-in.)}$$

$$J_{LOAD\ (reflected)} = [W_{LOAD} + W_{BELT} + W_{OTHER}]r^2\left(\frac{16\ oz.}{lb.}\right)\left(\frac{1}{m^2}\right) \quad \text{(oz.-in.}^2\text{)}$$

W_{BELT} = See Belt Weight in Actuator Section (lbs.)

$J_{WHEELS\ (reflected)}$ = See Drive & Idler Wheel Inertia in Actuator Section $\times \left(\frac{1}{m^2}\right)$ (oz.-in.^{2})

J_{MOTOR} = See Inertia in Motor Section (oz.-in.^{2})

(This will be an iterative process since the actual motor torque is unknown at this point)

$J_{RD\ (reflected)}$ = See Inertia for Reduction Device (oz.-in.^{2})

$$\omega = \frac{V_M}{r \times T_a} \quad \text{(rad/sec)}$$

Continues

Belt-Drive Torque (cont.):

$$T_{FRICTION} = \frac{F_T \, r}{e} \left(\frac{16 \text{ oz.}}{\text{lb.}}\right)\left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

$$F_T = \text{See Friction Table in Actuator Sections}$$
OR
$$\mu(W_{LOAD} + W_{OTHER}) \quad \text{(lbs.)}$$

$$T_{PRELOAD} = \text{See Preload Torque in Actuator Sections} \times \left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

$$T_{GRAVITY} = \frac{(W_{LOAD} + W_{BELT} + W_{OTHER})\, r \sin ø}{e} \left(\frac{16 \text{ oz.}}{\text{lb.}}\right)\left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

$$T_{EXT.} = \frac{F_{EXT.}\, r}{e} \left(\frac{16 \text{ oz.}}{\text{lb.}}\right)\left(\frac{1}{me'}\right) \quad \text{(oz.-in.)}$$

Belt-Drive Thrust:

$$\text{Thrust} = \frac{e}{r}(e'm)\left(\frac{\text{lb.}}{16 \text{ oz.}}\right)\left\{T_{TOTAL} - \left[J_{WHEELS}\left(\frac{m}{e'}\right) - J_{RD} - J_{MOTOR}\right]\frac{\omega}{386} - T_{PRELOAD}\right\} \text{ (lbs.)}$$

Belt Reflected Inertia:

$$J_{REFL} = J_{LOAD} + J_{WHEELS} + J_{RD} \quad \text{(oz.-in.}^2\text{)}$$

Symbols:

e = lead screw or belt efficiency

e′ = reduction efficiency

F_T = total friction force *(lbs.)*

$F_{EXT.}$ = force to do external work *(lbs.)*

J_{LOAD} = load inertia *(oz.-in.²)*

J_{LS} = lead screw inertia *(oz.-in.²)*

J_{MOTOR} = motor inertia *(oz.-in.²)*

J_{RD} = reduction device inertia *(oz.-in.²)*

J_{WHEELS} = bolt drive & idler wheel inertia *(oz.-in.²)*

Ø = angle of load from horizontal *(degrees)*

m = reduction ratio = $\frac{\text{input}}{\text{output}} = \frac{\text{motor rpm}}{\text{screw shaft rpm}}$

p = pitch of screw *(rev./in.)*

r = radius of belt drive wheel *(in.)*

t_a = acceleration time *(sec.)*

T_{ACC} = required torque to accelerate the load *(oz.-in.)*

$T_{BREAKAWAY}$ = breakaway torque *(oz.-in.)*

$T_{EXT.}$ = required torque to overcome external force *(oz.-in.)*

$T_{FRICTION}$ = required torque to overcome friction *(oz.-in.)*

$T_{GRAVITY}$ = required torque to overcome gravity *(oz.-in.)*

T_{MOTOR} = motor output torque at desired speed *(oz.-in.)*

$T_{PRELOAD}$ = torque required to overcome loading of carrier bearings and tension on screw or belt

T_{TOTAL} = required torque to move the load *(oz.-in.)*

μ = coefficient of static friction linear bearing system

V_M = maximum linear velocity *(in./sec.)*

ω = angular velocity *(rad./sec.)*

W_{OTHER} = weight of carriage or weight of top axis *(lbs.)*

W_{LOAD} = weight of load *(lbs.)*

SCREW FORM	EFFICIENCY (e)	
	Single Nut	A/L Nut*
Acme	0.60	0.50
Ball	0.90	0.85

*A is Antibacklash Acme, L is Low Backlash Ball

SIZING AND SELECTION LIMITING FACTORS

Torque Margin

The following torque margins are recommended:

Stepper = 2.0
Brushless Servo = 1.15
Brushed DC Servo = 1.15

Inertia Match

For best efficiency and dynamic performance:

$$1 \leq \frac{J_{REF}}{J_{MOTOR}} \leq 10$$

Critical Speed

Critical speed for a given length of a given diameter screw in a given bearing system is that rotational speed at which the screw will have a natural frequency of oscillation about its own axis. Curves of critical speed versus length are provided for each screw diameter in the screw drive actuator section of this catalog.

Screw/Nut Thrust Capacity

Screw nut thrust capacity is the axial load which the screw and nut can deliver to the carrier. This force is limited by the interaction of the screw and nut threads for a solid nut and by the rolling ball/thread system of the ball screw/nut. In the Tol-O-Matic actuator design, all axial load is supported by the screw in tension against the thrust bearings.

For solid nut actuators, maximum thrust and speed ratings are shown on the critical speed charts. Because of thermal considerations, the axial thrust to be provided by a solid nut at any operating speed must be limited such that:

$$\frac{\text{Thrust}}{\text{Max. Thrust Rating}} \times \frac{\text{Speed}}{\text{Max. Speed Rating}} \leq 0.1$$

Higher ratios can be used if the duty cycle is modest. Consult the factory for guidance.

For ball screw/nut actuators, the thrust ratings shown on the critical speed charts represent the thrust at which a screw/nut life of 10^6 inches (25×10^6 millimeters) can be expected. For other loads, life is given by:

$$\text{Life} = \left(\frac{\text{Rated Thrust}}{\text{Nut Load Thrust}} \right)^{\frac{10}{3}} \times 10^6 \text{ inches}$$

Belt Rating

For belt actuators, the required thrust must be less than the belt rating at the operating speed. These limits are shown in the belt actuator section of this catalog.

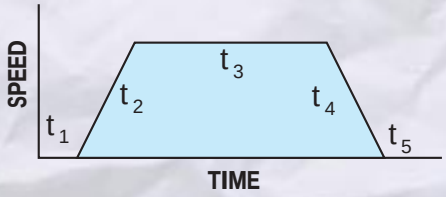
Backlash

Defined as the linear distance which is lost in positioning the nut when the screw direction of rotation changes. Backlash is directly related to the closeness of fit between the nut and screw.

NUT	SOLID		BALL	
	Single	Anti-Backlash	Single	Low Backlash
Backlash (in.)	0.007	0.003	0.015	0.002
Backlash (mm)	0.18	0.08	0.25	0.05
Designation	SN	SNA	BN	BNL

RMS Torque

The RMS torque must be less than the motor's continuous torque rating.

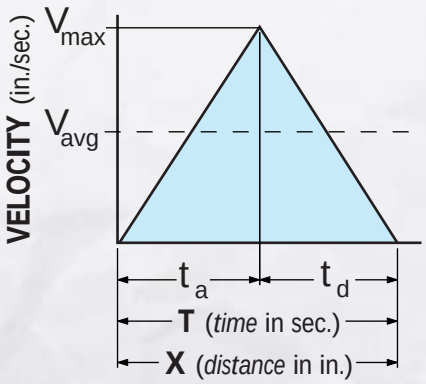


Torques are: T1,T2, T3, T4, T5

$$\text{RMS Torque} = \sqrt{\frac{T_1^2 t_1 + T_2^2 t_2 + T_3^2 t_3 + T_4^2 t_4 + T_5^2 t_5}{t_1 + t_2 + t_3 + t_4 + t_5}}$$

MOTION PROFILE EQUATIONS

Triangle Move Profile

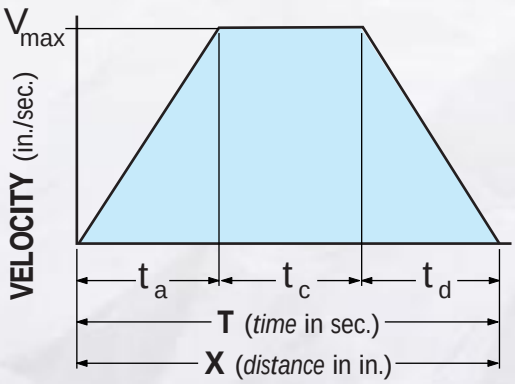


$$V_{max} = 2\,V_{avg} = 2\,\frac{X}{T}$$

$$t_a = t_d = \frac{X}{T}$$

$$A = D = \frac{V_{max}}{T} = \frac{4X}{T^2}$$

Trapezoidal Move Profile



Assume:

$$t_a = t_c = t_d = \frac{T}{3}$$

Then:

$$V_{max} = \frac{1.5\,X}{T}$$

$$A = D = \frac{4.5\,X}{T^2}$$

T = total move time *(sec.)*

X = total move distance *(in.)*

A = acceleration rate *(in./sec.²)*

D = deceleration rate *(in./sec.²)*

t_a = acceleration time *(sec.)*

t_d = deceleration time *(sec.)*

t_c = constant velocity time *(sec.)*

V_{avg} = average velocity *(in./sec.)*

V_{max} = maximum velocity *(in./sec.)*

APPLICATION DATA

Distributor

Name	
Distributor Name	
Date	Time
Phone:	Fax:

Customer

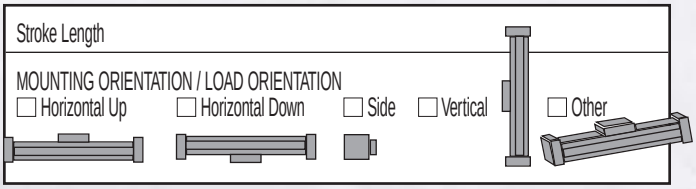
Name	Title
Company Name	
Address	
City	State Zip
Date	Time
Phone:	Fax:

Define Application

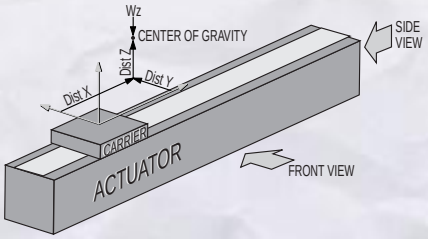
Stroke Length

MOUNTING ORIENTATION / LOAD ORIENTATION

☐ Horizontal Up ☐ Horizontal Down ☐ Side ☐ Vertical ☐ Other

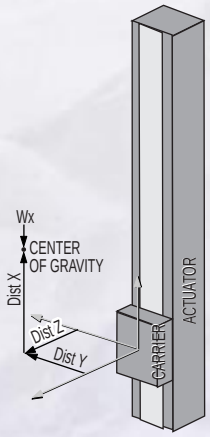


Horizontal & Side Mounting



FORCE LOAD			
MOVE FROM MOTOR		MOVE TO MOTOR	
(lbs or kgs) ☐ To Motor ☐ From Motor		(lbs or kgs) ☐ To Motor ☐ From Motor	
WEIGHT LOAD AND CENTER OF GRAVITY			
MOVE FROM MOTOR		MOVE TO MOTOR	
Dist X	(lbs or kgs)	Dist X	(lbs or kgs)
Dist Y	(lbs or kgs)	Dist Y	(lbs or kgs)
Dist Z	(lbs or kgs)	Dist Z	(lbs or kgs)

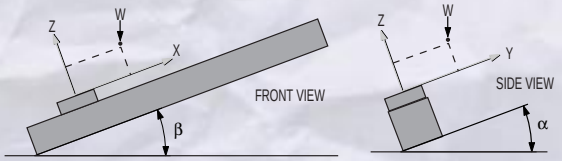
Vertical Mounting



FORCE LOAD			
UP MOVE	(lbs or kgs)	☐ Up	☐ Down
DOWN MOVE	(lbs or kgs)	☐ Up	☐ Down
WEIGHT LOAD AND CENTER OF GRAVITY			
UP MOVE (lbs or kgs)		DOWN MOVE (lbs or kgs)	
Dist X		Dist X	
Dist Y		Dist Y	
Dist Z		Dist Z	

Custom Mounting

(Use Horizontal and Single Mounting chart for force and load weight data)



Angle α	Angle β

Precision

Repeatability	in or mm
Absolute Accuracy	in or mm
Resolution	in or mm
HOLD POSITION? ☐ After Move ☐ During Power Loss	

Position Control

POSITION CONTROL

- ☐ Manual Jog
- ☐ External Control Signal
  - ☐ Analog Position
  - ☐ Analog Velocity
  - ☐ Analog Torque
  - ☐ Digital (Step & Direction)
- ☐ via Position Sensors
- ☐ Programmable

Duty Cycle

1. _____(%) ON Time / Total Cycle Time

Based on worst case 10 minute cycle

2. Max. *continuous* ON Time _____ sec

ON Time = Time in Motion (of motor)

Life Required

1. Number of Operating Cycles (Complete Extend / Retract Motion)

per minute per hour

per day per week

Min. Maintenance Interval

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Axes of Motion

☐ Single

☐ Multiple #

☐ Synchronized #

Feedback Required

Incremental Feedback ☐ Yes ☐ No

Move Profile

MOTION PROFILE
Move Distance in or mm

Dwell Time After Move

METHOD - MAX SPEED
Max. Speed

☐ Trapezoidal

☐ Constant Speed Distance

METHOD - MOVE TIME
Max. Speed in/sec or mm/sec

Move Time sec

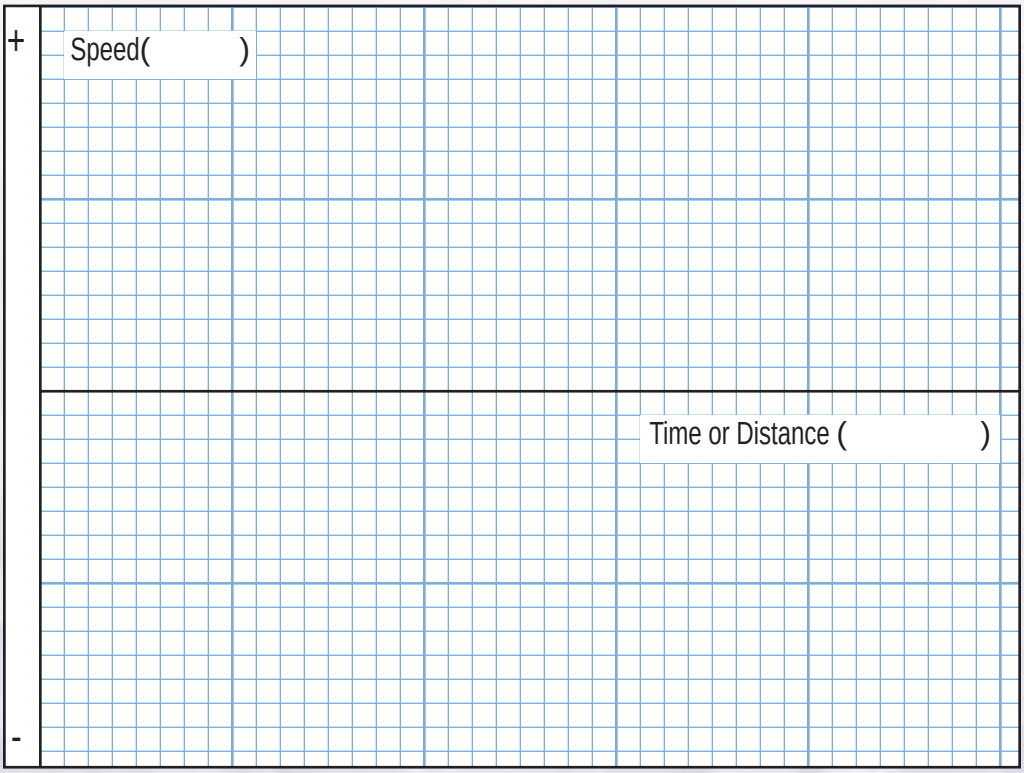
Accel. /Decel. Time sec

Input Functions

Output Functions

Motion Profile

Graph your most demanding cycle, include accel/decel, velocity and dwell times. You may also want to indicate load variations and I/O changes during the cycle. Label axes with proper scale and units.



Actuator

STYLE
☐ SCREW-DRIVE
☐ B3S ☐ M3S ☐ SLS ☐ MLS
☐ BCS ☐ MCS

☐ BELT-DRIVE
☐ B3B ☐ M3B ☐ BCB ☐ MCB

SERIES
☐ 10 ☐ 15 ☐ 20

SCREW TYPE
☐ ACME ☐ Ball

☐ Single ☐ Low-Backlash
☐ Anti-Backlash

CARRIER
☐ Single ☐ Dual _____ in or mm
(Center to Center Distance)

MOTOR MOUNTING ORIENTATION
☐ SCREW-DRIVE
☐ In-Line ☐ Reverse Parallel

☐ BELT-DRIVE
☐ In-Line ☐ Reduction

Motor

TYPE
☐ Brushless Servo
☐ Stepper
☐ Brushed DC

☐ 110 VAC
☐ 230 VAC

Interface

OPERATOR METHOD
☐ PIT Panel Control
☐ JS Joystick
☐ SIT Hand-held Programmer

☐ STAND ALONE
HOST: ☐ Computer
☐ PLC
☐ Other:

Operating Environment

FAX TO TOL-O-MATIC, INC. 612-478-8080

TERMS/CONDITIONS OF SALE

1. **ORDER OF ACCEPTANCE.** All orders or services are subject to acceptance in Minnesota by the written approval of an authorized official of Tol-O-Matic, Incorporated. Any such order shall be subject to these Terms and Conditions of Sale, and acceptance shall be conditioned on Purchaser's assent to such conditions. Purchaser's assent shall be deemed given unless Purchaser shall expressly notify Tol-O-Matic, Incorporated in writing to the contrary within five (5) days after receipt of acknowledgment to confirmation of an order.

2. **CANCELLATION AND CHANGES.** No order accepted by Tol-O-Matic, Incorporated may be modified in any manner by Purchaser unless agreed to in writing, by an authorized official of Tol-O-Matic, Incorporated. Order cancellations, including reductions to order quantities, and changes shall be governed by the following:

   a. Any standard product order scheduled for shipment within ten (10) working days of your request to cancel or modify will be shipped as previously acknowledged and you agree to accept shipment and payment responsibility, in full, at the price agreed upon.

   b. "Customer Special" orders scheduled for shipment within twenty (20) working days of your request to cancel or modify will be shipped as previously acknowledged and you agree to accept shipment and payment responsibility, in full, at the price agreed upon.

   c. All work in connection with "Customer Special" orders, not covered under Paragraph B, will be stopped immediately upon notification, and you agree to re-imburse Tol-O-Matic, Incorporated for all work-in-process and any materials or supplies used, or for which commitments have been made by us in connection therewith.

3. **QUOTATIONS AND PRICES.** Written quotations automatically expire 30 calendar days from the date issued unless terminated sooner by written notice. (Verbal quotations expire, unless accepted in writing, the same day.)

   All published prices and discounts are subject to change without notice. In the event of a net price change, the price of product(s) on order will be the price in effect on the date of order acknowledgment Any addition to an outstanding order will be accepted at prices in effect when the addition is made.

4. **MINIMUM BILLING.** Orders amounting to less than $35.00 net will be billed at $35.00

5. **TAXES.** Any Manufacturer s Tax, Retailers Occupation Tax, Use Tax, Sales Tax, Excise Tax, Duty, Customer, Inspection or Testing Fee, or any other tax, fee or charge of any nature whatsoever, imposed by any government authority, on or measured by any transactions between Tol-O-Matic, Incorporated and Purchaser shall b paid by the Purchaser in addition to the prices quoted or involved. In the event Tol-O-Matic, Incorporated shall be required to pay any such tax, fee or charge, Purchaser shall re-imburse therefore.

6. **TERMS OF PAYMENT.** Net invoice amount is due within 30 days from date of invoice subject to credit approval. A11Ú2% per month service charge shall apply to all invoices in excess of 30 days. All clerical errors are subject to correction. All invoices in excess of 60 days will subject that account to an immediate shipping hold.

7. **F.0.B. POINT.** All sales are F.0.B. Hamel, Minnesota, unless quoted otherwise.

8. **DELIVERY.** Delivery of product(s) by Tol-O-Matic, Incorporated to a carrier shall constitute delivery to Purchaser, and regardless of freight payment, title and all risk or loss or damage In transit shall pass to Purchaser at that time.

   Should shipment be held beyond scheduled date, upon request of Purchaser, product will be billed and Purchaser agrees to accept any charges for warehousing, trucking and other expenses as may be incident to such delay.

   Great care is taken by Tol-O-Matic, Incorporated in crating its product. Tol-O-Matic, Incorporated cannot be held responsible for breakage after having received "In Good Order" receipts from the transporting carrier. All claims for loss and damage must be made by Purchaser to the carrier within 14 days from receipt of goods. Tol-O-Matic, Incorporated will assist insofar as practical in securing satisfactory adjustment of such claims wherever possible.

   Claims for shortages or other errors must be made in writing to Tol-O-Matic, Incorporated and any additional expense of the method or route of shipment specified by Purchaser shall be borne by the Purchaser.

9. **SHIPPING SCHEDULES.** All quoted shipping schedules are approximate and will depend upon prompt receipt from Purchaser of confirming copy of Purchase Order. Dimensional drawings and specifications submitted by Tol-O-Matic, Incorporated to Purchaser for approval must be returned to Tol-O-Matic, Incorporated within 10 working days, with approval granted, and any exceptions noted, in order to avoid delay in manufacturing schedules.

   Orders which include penalty clauses for failure to meet shipping schedules will not be acceptable, except in those cases specifically approved in writing by the General Manager of Tol-O-Matic, Incorporated.

   Tol-O-Matic, Incorporated shall not be liable for damage as a result of any delay due to any cause beyond Tol-O-Matic, Incorporated s reasonable control, including, without limitation, an Act of Nature; act of Purchaser; embargo, or other government act, regulation or request; fire; accident; strike; slow down; war; riot; flood; delay in transportation; and inability to obtain necessary labor, materials or manufacturing facilities. In the event of any such delay, the date of delivery shall be extended for a period equal to the time loss by reason of the delay. The acceptance of the product when delivered shall constitute a waiver of all claims for damages caused by any such delays.

10. **RETURN OF PRODUCT.** No product may b returned without first obtaining a Return Goods Authorization form and confirming memorandum from Tol-O-Matic. Incorporated. Product, if accepted for credit, shall be subject to a minimum service charge of 35% of the invoice price and all transportation charges shall be prepaid by the Purchaser; however, assembled products classified as "special," such as Cable Cylinders and other products which have been modified or built as "Customer Specials," are not returnable to Tol-O-Matic, Incorporated.

11. **WARRANTY.** TOL-O-MATIC, INCORPORATED, WARRANTS PRODUCT MANUFACTURED BY IT TO BE FREE FROM DEFECTS IN MATERIAL AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF SHIPMENT BY TOL-O-MATIC, INCORPORATED. IF WITHIN SUCH PERIOD ANY SUCH PRODUCT SHALL BE PROVED TO TOL-O-MATIC, INCORPORATED'S SATISFACTION TO BE SO DEFECTIVE, SUCH PRODUCT SHALL EITHER BE REPAIRED OR REPLACED AT TOL-O-MATIC'S OPTION.

    THIS WARRANTY SHALL NOT APPLY:

    a. TO PRODUCT NOT MANUFACTURED BY TOL-O-MATIC, INCORPORATED WITH RESPECT TO PRODUCT NOT MANUFACTURED BY TOL-O-MATIC, INCORPORATED. THE WARRANTY OBLIGATIONS OF TOL-O-MATIC, INCORPORATED SHALL IN ALL RESPECTS CONFORM AND BE LIMITED TO THE WARRANTY ACTUALLY EXTENDED TO TOL-O-MATIC, INCORPORATED BY ITS SUPPLIER.
    b. TO PRODUCT WHICH SHALL HAVE BEEN REPAIRED OR ALTERED BY PARTIES OTHER THAN TOL-O-MATIC, INCORPORATED SO AS, IN JUDGMENT, TO AFFECT THE SAME ADVERSELY, OR
    c. TO PRODUCT WHICH SHALL HAVE BEEN SUBJECT TO NEGLIGENCE, ACCIDENT, OR DAMAGE BY CIRCUMSTANCES BEYOND THE CONTROL OF TOL-O-MATIC, INCORPORATED OR TO IMPROPER OPERATION MAINTENANCE OR STORAGE, OR TO OTHER THAN NORMAL USE AND SERVICE.

    THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS AND IMPLIED WARRANTIES WHATSOEVER, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, TOL-O-MATIC, INCORPORATED SHALL NOT BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES WHATSOEVER WITH RESPECT TO PRODUCT MANUFACTURED OR SUPPLIED BY TOL-O-MATIC, INCORPORATED OR SERVICE RENDERED BY IT.

12. **CONSEQUENTIAL DAMAGE.** Tol-O-Matic, Incorporated, shall not, under any circumstances be liable for consequential damages.

13. **SERVICE CHARGES.** Should the Purchaser request the service of any erector, demonstrator or service man (except as specifically provided for and included in the price of the product) such service will be rendered at the rate outlined in the schedule of field service charges in effect at the date of request.

TOL-O-MOTION™ SIZING AND SELECTION SOFTWARE AND CAD LIBRARY SUPPORT

Combine Tol-O-Matic's NEW sizing and selection software with our FREE CAD Library packages and you will get state-of-the-art software packages to work with existing CAD programs and design systems. Used in conjunction with Tol-O-Matic product catalogs, you now can have all the important product information necessary to easily turn design into reality.

NOW AVAILABLE ON CD-ROM!

Tol-O-Matic's new CD-ROM is now available and contains: the new Tol-O-Motion Sizing and Selection Software along with an overview on how to use it, All current CAD Library files in both .dwg and .dxf formats, product overviews of all Tol-O-Matic Axidyne and pneumatic product offerings, PDF files of all Tol-O-Matic's current product catalogs PLUS a virtual tour of Tol-O-Matic's facility and more!

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For your free disks or CDROM, call your local Tol-O-Matic distributor or the factory at:

1-800-328-2174

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TOL-O-MATIC *EXCELLENCE IN MOTION®*

Tol-O-Matic makes products for anything that moves!

1. AXIDYNE ELECTRIC LINEAR MOTION PRODUCTS
- Brushless Servo Systems
- Stepper Systems
- Brushed Dc Systems
- Screw-drive Actuators
- Belt-drive Actuators

CAT. NO. 3600-4077

2. RODLESS SLIDES
- Linear Slides

CAT. NO. 0600-0001
- Magnetically Coupled Slides

CAT. NO. 2400-4000

3. GRIPPERS & ROTARY ACTUATORS
- Grippers and Rack-and-Pinion Actuators

CAT. NO. 1900-4000
- Vane Rotary Actuators

CAT. NO. 1800-0006

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BC2 Series™

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BC3 Series™

CAT. NO. 3400-4000

BC4 Series™

CAT NO. 6900-4000

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